Natural Sciences Grade 6

By:
Siyavula Uploaders

Natural Sciences Grade 6

By:
Siyavula Uploaders

Online:
< http://cnx.org/content/col11079/1.1/ >

C O N N E X I O N S

Rice University, Houston, Texas

Collection structure revised: September 16, 2009
PDF generated: February 6, 2011
For copyright and attribution information for the modules contained in this collection, see p. 173.

Table of Contents

1 Term 1

1.1 To understand clearly what an ecosystem is 1
1.2 To classify plants according to their characteristics 5
1.3 To classify animals according to their characteristics 9
1.4 To indicate differences among vertebrates 12
1.5 To discover how animals are adapted to survive in their habitat 14
1.6 To understand how animals and insects differ with regard to reproduction/life cycle 18
1.7 To classify animals according to their feeding habits 22
1.8 To distinguish between herbivores, carnivores and omnivores 23
1.9 To describe a neighbourhood ecosystem 28
1.10 To understand the concepts "biomes" and "symbioses" 29
1.11 To study the important role of plants in the ecosystem 33
1.12 To understand the natural balance between living organisms and available sources 40
1.13 To cultivate a positive altitude towards the environment and natural resources 45
1.14 Term 2 47

2 Term 3

2.1 To discuss the use of stars and planets with regard to the development of calendars 99
2.2 To indicate the routes taken by early discoverers who navigated by the stars 102
2.3 To discuss the concept constellations and investigating the movement of the stars 103
2.4 To identify constellations and stars with the help of a planisphere 106
2.5 To talk about using stars to make predictions 113
2.6 To find out how african peoples used the position of the stars to their advantage 115
2.7 To discuss igneous rocks as a type of rock formation [..... 116
2.8 To discuss sedimentary rocks as a type of rock formation 120
2.9 To discuss metamorphic rocks as a type of rock formation 126
2.10 To explain how fossils were formed 128
2.11 To talk about the reconstruction, identification and conservation of fossils 131
2.12 To discuss the ways in which organisms change over time 137
2.13 To discuss the role of rivers in nature 139

3 Term 4

3.1 To identify materials 147
3.2 To classify materials 149
3.3 To discover the properties of materials 152
3.4 To distinguish the most important groups of materials 160
3.5 To determine the meaning of the term "soluble" 164
3.6 To determine the factors that affect the solubility of materials 166
3.7 To discus the advantages of water as a solvent 171

Attributions 173

Chapter 1

Term 1

1.1 To understand clearly what an ecosystem is[1]

1.1.1 NATURAL SCIENCES

1.1.2 Ecosystems and the environmental balance

1.1.3

1.1.4 EDUCATOR SECTION

1.1.5 Memorandum

(a) A forest is a stretch of land that is covered with dense trees, shrubs, ferns, etc. and animals. These plants and animals live together in the dense bushes.

Assignment 1:
f) tree (producer)
mouse (primary consumer)
owl (secondary consumer)
jackal (tertiary consumer)

1.1.6 LEANER SECTION

1.1.6.1 Content

1. Introduction

All living things on earth and the way in which they influence (or are influenced by) the environment form an ecosystem.

The word ecosystem is derived from the Greek word "oikos", which means house or household. Just like members of a family live together, support and influence each other and the environment (and are in turn affected and influenced by it), so organisms live together, reproduce and are dependent on each other for food. They have a close relationship with the soil, sun, water and air.

1.1.6.1.1 ACTIVITY: To understand clearly what an ecosystem is [LO 1.3]

Let's study an example of an ecosystem:

(a) What is a forest?_____
_____

[1] This content is available online at <http://cnx.org/content/m20131/1.1/>.

_____
_____
_____
_____
_____
_____

A forest is much more than a large area of land covered with trees. Shrubs, vines, ferns, mosses and toadstools live in the shade of trees. The forest also swarms with birds, mammals, reptiles, amphibians and insects. A forest is therefore all these plants and animals living together.

The animals depend on plants for food, while plants use sunlight, carbon dioxide, water and minerals to make food for themselves and other organisms in the forest.

The living organisms (plants and animals) together with the non-living environment (air, water, sun and soil) constitute an ecosystem.

(b) Tabulate an example of each of the following found in a forest.

Species	My example of. . .
bird	_____
mammal	_____
reptile	_____
insect	_____
amphibian	_____

Table 1.1

(c) Now sketch these five examples in the drawing to complete it!

(d) The Ecosystem concept

The organism-environment interaction leads to the ecosystem concept, elaborating the interaction between matter, energy and organism.

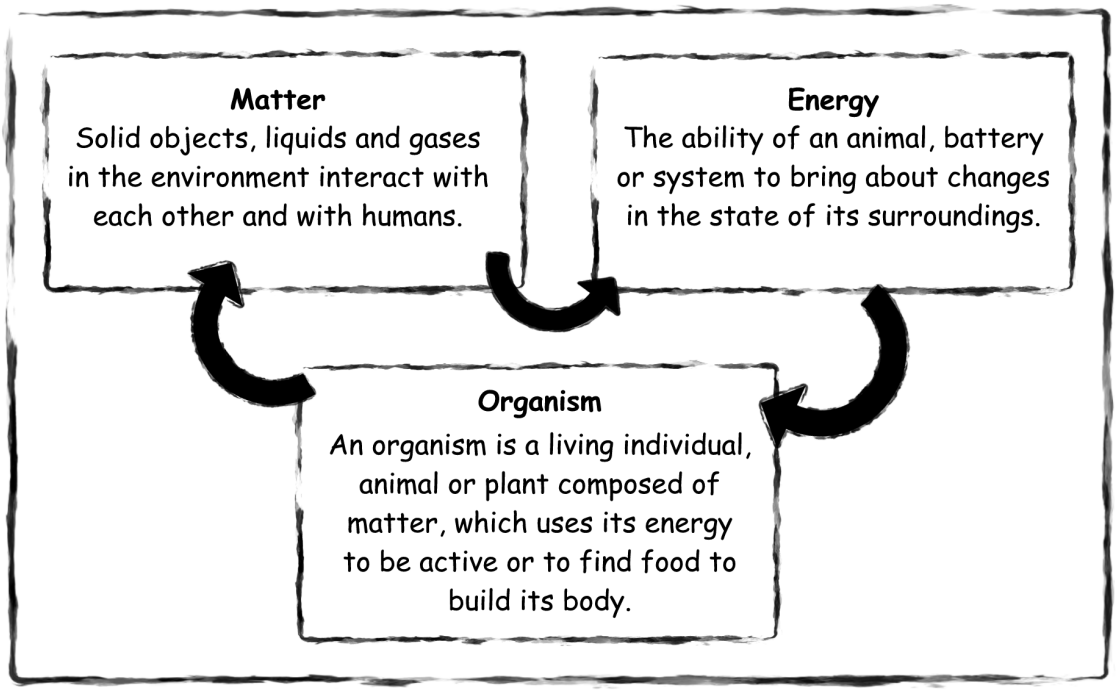


Figure 1.1

1.1.6.1.1.1 An ecosystem

(e) How big is an ecosystem?

An ecosystem can be of any size, from a puddle of water on the pavement to the entire rain forest in the Amazon or an even larger area.

A forest with its trees, plants, insects, birds, etc., is an ecosystem of certain kinds of organisms that occupy a certain environment. On the other hand, a rock in the shade of a forest with its mosses and other rock plants, insect larvae and centipedes, is also an ecosystem. The system is therefore integrated, with parts that are intimately related to one another. Anything affecting a part of the system will also affect the rest.

Assignment 1:

(f) Study the sketch of the forest ecosystem below:

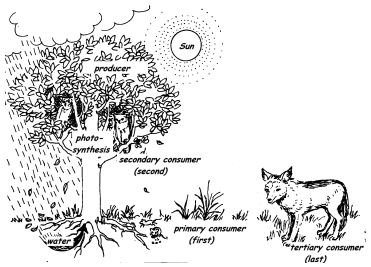


Figure 1.2

Name the:
producer: _____
primary consumer: _____
secondary consumer: _____
tertiary consumer: _____
Primary means first.
Secondary means second or less important.
Tertiary means the third in this case.
2. The ecosystem
is the living organisms together with the _____
indivisibly linked and mutually interactive.
The living part can be divided into:
(a) food producers - mainly green plants
(b) food consumers - which are macro consumers (animals which eat other organisms)
or
decomposers (bacteria or fungi which break up dead organisms)

1.1.7 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.3: We know this when the learner evaluates data and gives feedback on findings.

1.2 To classify plants according to their characteristics[2]

1.2.1 NATURAL SCIENCES

1.2.2 Ecosystems and the environmental balance

1.2.3

1.2.4 EDUCATOR SECTION

1.2.5 Memorandum

Assignment 2:

1. petiole
2. leaf-base
3. leaf margin
4. lamina (leaf-blade)
5. veining

Assignment 3:

1. net-like veins
2. net-like veins
3. parallel veins
4. net-like veins
5. net-like veins
6. net-like veins
7. parallel veins

1.2.6 LEANER SECTION

1.2.7 Content

1.2.7.1 ACTIVITY: To classify plants according to their characteristics [LO 2.2]

There are many thousands of species of plants and animals on the earth and they all differ from one another. When plants and animals with the same characteristics are grouped together (classified), it is easier to study them.

Why is it important to also carry out the classification of plants and animals as part of ecological studies?

____
____
____
____
____
____

The following table indicates how plants can be classified according to their external characteristics.

[2] This content is available online at <http://cnx.org/content/m20135/1.1/>.

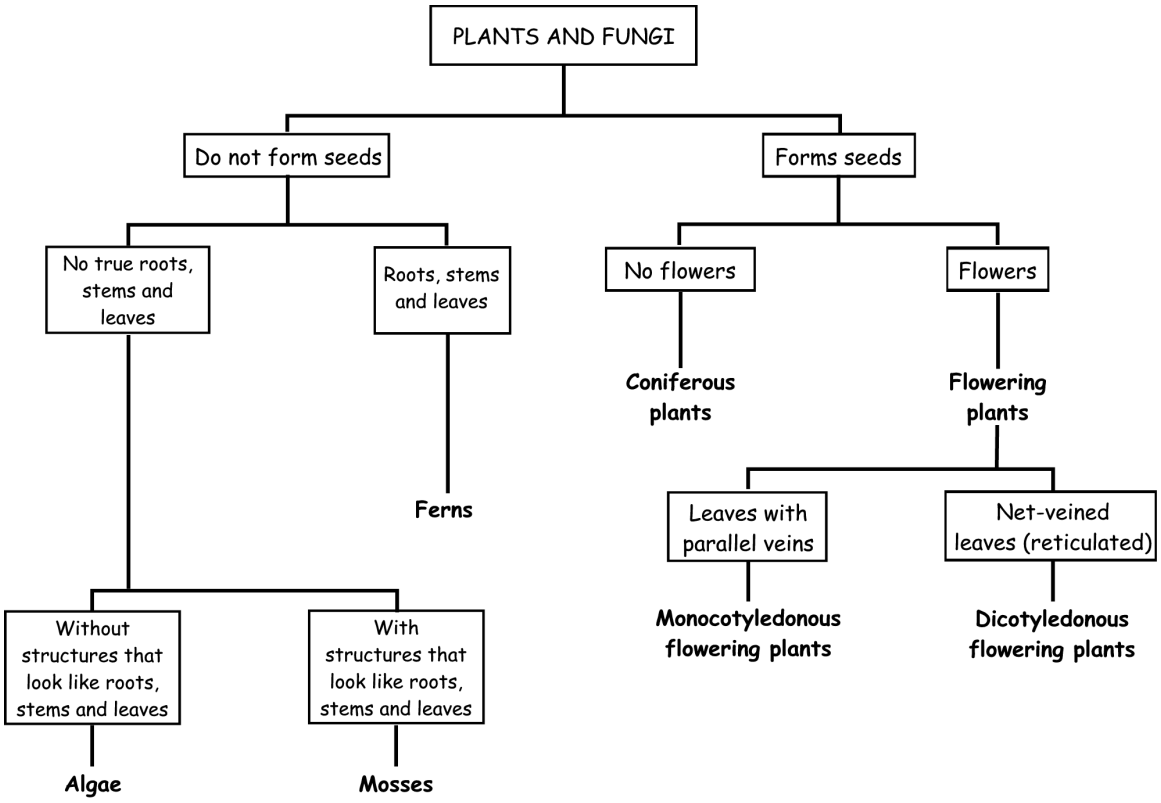


Figure 1.3

(i) Classification of plants on the basis of their leaves

Plants can be classified according to their leaves.

Net-like veins

The flat section of the leaf is called the leaf-blade (lamina). It is attached to the stem by means of a leaf-stalk (petiole). The petiole runs into the vein to form the main vein. The main vein branches and re-branches into lateral veins, forming a network of veins in the lamina. This is known as net-like (reticulated) veins.

Assignment 2:

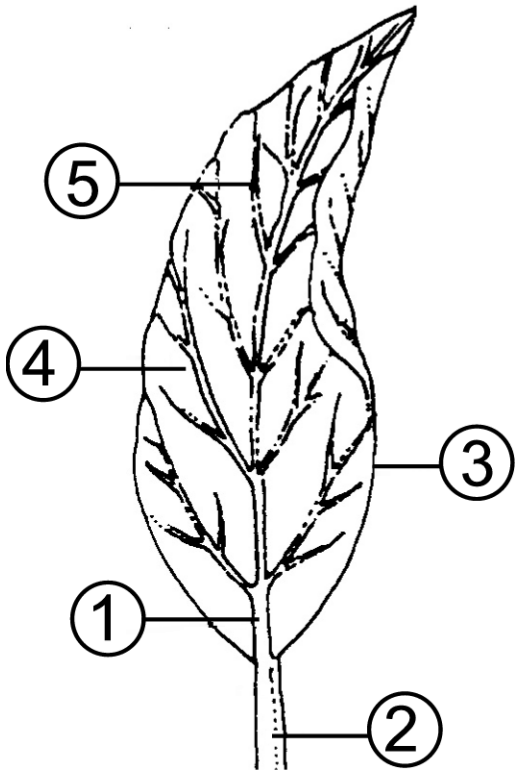


Figure 1.4

1. _____
_____
2. _____
_____
3. _____
_____
4. _____
_____
5. _____
_____

Assignment 3:
Study the sketch below and classify the leaves of the following plants as having net-like or parallel veins.

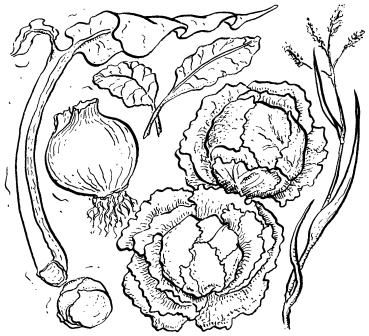


Figure 1.5

PEER ASSESSMENT:

PLANT	NET-LIKE OR PARALLEL VEINS
rhubarb	
brussels sprouts	
onion	
spinach	
cabbage	
lettuce	
grass	

Table 1.2

1.2.8 ASSESSMENT

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.2: We know this when the learner categorises information.

1.3 To classify animals according to their characteristics[3]

1.3.1 NATURAL SCIENCES

1.3.2 Ecosystems and the environmental balance

1.3.3

1.3.4 EDUCATOR SECTION

1.3.5 Memorandum

CRITERIA	1	2	3	4
Creative layout				
Meaningful illustrations				
Completeness				

Table 1.3

1.3.6 LEANER SECTION

1.3.7 Content

1.3.7.1 ACTIVITY: To classify animals according to their characteristics [LO 2.2]

Animals with a backbone or spinal column and an internal skeleton (endoskeleton) are placed in one group and animals without a backbone or a spinal column are placed in another group. Animals in the group with a spinal column are called vertebrates or Vertebrata. Animals in the group without a backbone or spinal column are called invertebrates or Invertebrata. The bodies of some of the Invertebrata are protected by a hard covering on the outside, e.g. the crab or the grasshopper. This hard covering is known as the external skeleton or exoskeleton.

[3]This content is available online at <http://cnx.org/content/m20139/1.1/>.

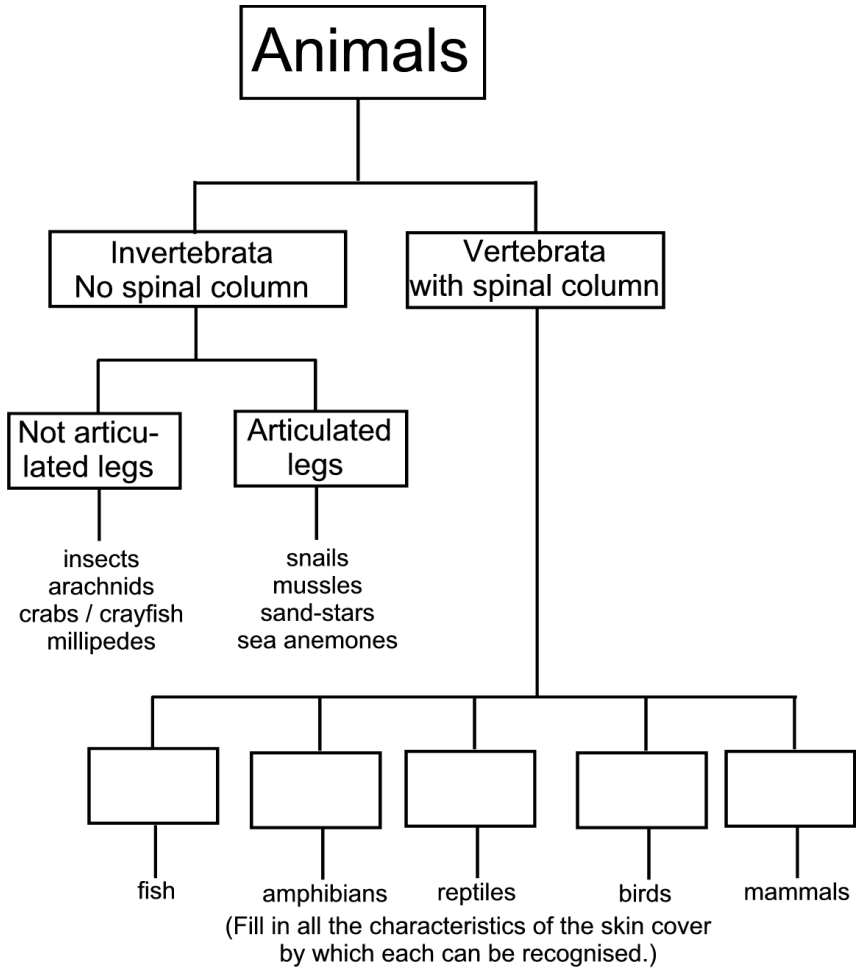


Figure 1.6

An interesting question: fungi are not indicated as part of either the plants or the animals. Try to found out where they belong.

Assignment 4:

Study the following sketches and group the animals on the basis of the preceding diagram.

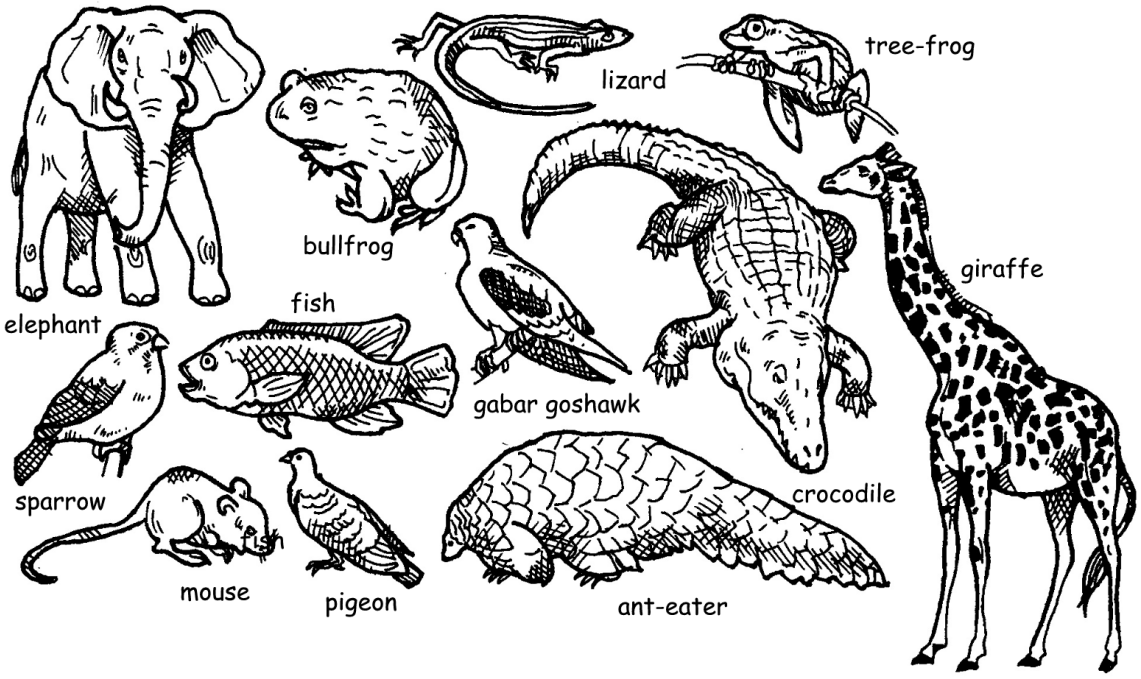


Figure 1.7

FISH				

Table 1.4

CRITERIA	**YES/NO**
Could classify animals easily	
Classified most animals correctly	
Require more exercise in classification	

Table 1.5

(i) Criteria for sorting vertebrates

Vertebrates can be sorted on the basis of their type of body covering.

Assignment 5:

Consult the diagram once again and provide a diagrammatical representation of the various vertebrates with their specific body covering. Be creative and use illustrations as well as words.

1.3.8 ASSESSMENT

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.2: We know this when the learner categorises information.

1.4 To indicate differences among vertebrates[4]

1.4.1 NATURAL SCIENCES

1.4.2 Ecosystems and the environmental balance

1.4.3 EDUCATOR SECTION

1.4.4 Memorandum

Assignment 6:

a. They hibernate or sleep or remain very inactive.

b. They develop cold shivers and begin to shiver in order to raise the body temperature.

c. They develop a fever and begin to sweat in order to lower the body temperature. They become tired more quickly and rest a lot.

d. The mammals care for their young until they are strong enough, but this is not done by reptiles. The young are not cared for and must take care of themselves.

e. Oviparous: lay eggs outside of the body Viviparous: the young are born alive

f. The human is the most highly developed being and its physical, emotional and mental development therefore take much longer than that of other mammals.

1.4.5 LEANER SECTION

1.4.6 Content

1.4.6.1 ACTIVITY: To indicate differences among vertebrates [LO 2.1]

(i) Other differences between Vertebrates

Animals also differ from one another with regard to what they eat, the organs used for movement, their ways of reproduction and the care of their young.

Ø Mammals

All animals that feed their young with milk are called mammals. Mammals care for their young until they are strong enough to be able to survive on their own. They also are warm-blooded animals, which means that their body temperature must remain more or less constant all the time.

Most mammals are land animals, such as ungulates (horses); predators (lions); rodents (rats); insectivores (hedgehogs) and anthropoids (baboons). A few species also live in the water, such as the dolphin, the whale and the seal.

Ø Reptiles

Reptiles are cold-blooded animals, which means that their bodies have more or less the same temperature as that of the surrounding environment. If it is too hot, for example, lizards will seek shelter in the shade.

[4]This content is available online at <http://cnx.org/content/m20157/1.1/>.

Reptiles do not suckle their young. As soon as the young are born, they go their own way and take care of themselves.

Assignment 6: Group work

Discuss the following questions in your groups and then answer them in full sentences:

1. What do many reptiles do in the winter when it becomes very cold?

_____
_____
_____
_____

(1)

2. What happens to mammals when their body temperature drops too low? Why does the body display such a reaction?

_____
_____
_____
_____

(2)

3. What happens to mammals when their body temperature rises too high? How is the temperature restored?

_____
_____
_____
_____

(2)

4. How does reproduction in mammals differ from that in reptiles?

_____
_____
_____
_____

(2)

5. Most lizards are oviparous and most mammals are viviparous. Find out what this means and explain the difference.

_____
_____
_____
_____

(2)

6. Humans suckle their young the longest. Why is this so?

_____
_____
_____
_____

(1)

SUMMATIVE: 10

1.4.7 ASSESSMENT

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1: We know this when the learner recalls meaningful information.

1.5 To discover how animals are adapted to survive in their habitat[5]

1.5.1 NATURAL SCIENCES

1.5.2 Ecosystems and the environmental balance

1.5.3

1.5.4 EDUCATOR SECTION

1.5.5 Memorandum

Assignment 7:

1. - scales
2. - tail fin
3. - lateral line
4. - gill slit
5. - dorsal fin
6. - eye

1.5.5.1 FUNCTIONS

1. Make the body streamlined so that it offers as little resistance as possible while the fish swims.

2. Slime that is secreted by the glands in the epidermis makes the scales smooth and slimy. This helps the fish to move through the water more easily.

3. The water flows in at the gill slit and flows over the gills so that oxygen can be taken up by the blood vessels. The gill slit also covers the gills.

4. It has powerful muscles and is moved back and forth so that the fish can move forwards.

5. It is there to keep the fish upright and to help it maintain its balance.

The lateral line consists of a long row of openings that house nerve cells. These enable the fish to become aware of differences in pressure and thereby to determine its depth in the water.

Assignment 8:

PIGEON

1. To peck up food; to build its nest; to feed its chicks; to preen itself and for defence

2. The feathers, in particular the light quills, enlarge the wing surface.

3. Feathers are poor conductors of heat and therefore maintain the body heat of the pigeon. The covert feathers occur over virtually the entire body and the plumules are found underneath them.

4. The toe that points backwards helps to balance the pigeon. The feet also help the pigeon when it walks on the ground and to support its weight when it sits on a branch.

5. It makes the neck very mobile and the pigeon therefore can move its head in any direction.

6. To protect the foot and keep it dry.

7. It makes the pigeon even more streamlined and reduces the air resistance when the pigeon flies

1.5.6 LEANER SECTION

1.5.7 Content

1.5.7.1 ACTIVITY: To discover how animals are adapted to survive in their habitat [LO 2.3]

(i) Differences with regard to external build

Animals are adapted to be able to survive in their habitat, e.g. fish are adapted to be able to live in water.

[5] This content is available online at <http://cnx.org/content/m20141/1.1/>.

1.5.7.2 Assignment 7

Study the sketch of the carp (freshwater fish) and identify the external body parts. Write down the name of the body part next to the correct number:

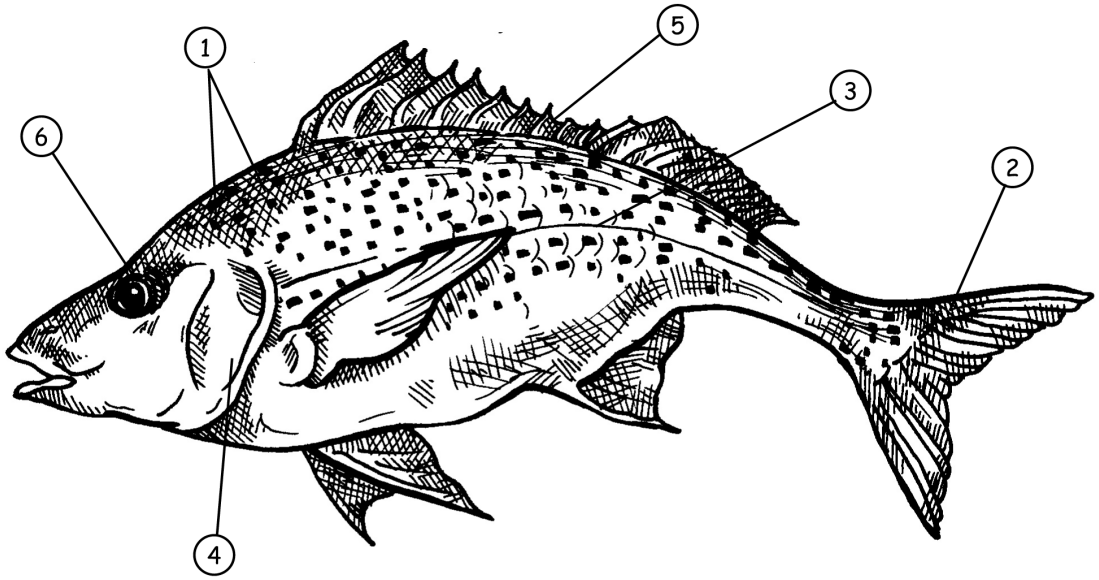


Figure 1.8

1. _____
_____
3. _____
4. _____
5. _____
6. _____

Each of these external body parts plays an important role in the survival of the fish in the water. Indicate the function of each of the following:

CHARACTERISTIC	FUNCTION
spindle-shaped body	_____
scales	_____

continued on next page

gill slit	
tail fin	
dorsal fin	
lateral line	

Table 1.6

Assignment 8
Also study the sketch of the external build of the pigeon and answer the questions that follow:

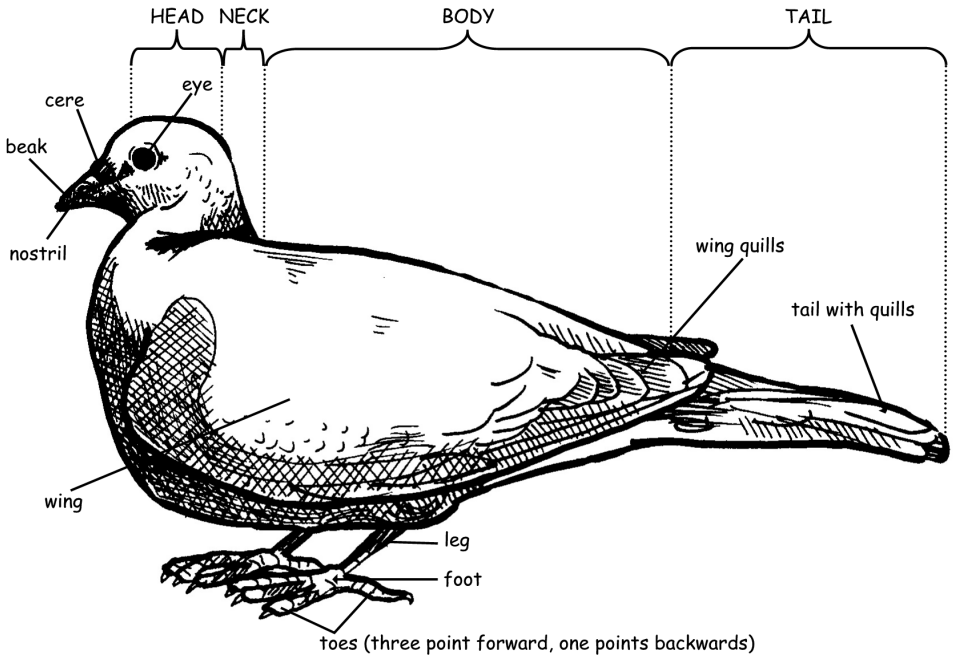


Figure 1.9

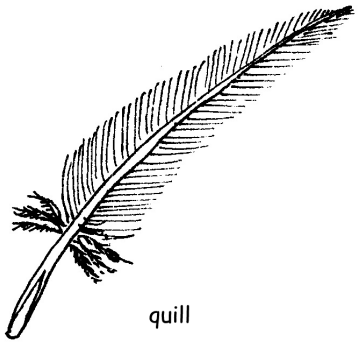


Figure 1.10

1. The pigeon has a short, horny beak. Name five functions of the beak.

_____
_____
_____
_____
_____

2. Its front limbs have been modified into wings so that the pigeon can fly. The strong pectoral muscles on either side of the sternum move the wings like oars that press against the air. In this manner the pigeon is propelled upwards and forwards. What helps to enlarge the surface of the wings?

3. Covert feathers and plumules are also found on the pigeon's body. What is their function?

_____
_____

4. The feet of the pigeon also have been adapted to its habits. The three toes that point forwards and the one that points backwards are specially adapted. For what?

_____
_____

5. The neck is quite long and mobile. What is the advantage of this for the pigeon?

_____
_____

6. The feet are covered in scales. Why?

_____
_____

7. The free tips of the feathers point backwards and the body is boat shaped. Why is this so?

_____
_____
_____
_____

Figure 1.11

1.5.7.3 SELF-ASSESSMENT

CRITERIA	NO/YES
I easily could identify the function of the various body parts	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
I could draw logical conclusions	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _
I could work independently	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Table 1.7

1.5.8 ASSESSMENT

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.6 To understand how animals and insects differ with regard to reproduction/life cycle[6]

1.6.1 NATURAL SCIENCES

1.6.2 Ecosystems and the environmental balance

1.6.3

1.6.4 EDUCATOR SECTION

1.6.5 Memorandum

Sequence:

B;
D;
C;
A

[6]This content is available online at <http://cnx.org/content/m20143/1.1/>.

1.6.6 Leaner Section

1.6.7 Content

1.6.7.1 ACTIVITY: To understand how animals and insects differ with regard to reproduction/life cycle [LO 2.3]

(i) **Animals also differ with regard to their reproduction**

Some young look just like the adults when they are born, while others first need to undergo a metamorphosis (change) before they look like the adults. Some animals undergo an incomplete metamorphosis, while others undergo a complete metamorphosis. A complete metamorphosis consists of the following stages: eggs are laid; larvae hatch; then they develop into pupae from which the adults finally develop.

1.6.7.2 INSECTS: FRUIT FLIES

Fruit flies belong to the Drosophila family and are used extensively as laboratory flies with which experiments are done. In nature, these flies sometimes cause extensive damage in fruit orchards if they are not combated early enough.

Adult fruit flies lay their eggs in the skin of the fruit, which then rot quickly and fall from the trees. The rotting fruit pulp is the source of food for the larvae that hatch. After a few days, the larvae crawl into the ground and change into a pupae. The mature fly appears from the pupa after about two to three weeks.

In order to combat the fruit fly, it is necessary to treat both the adult fly that contaminates the fruit in the trees as well as the soil under the trees, in which the pupae are, with pesticides.

Each female can lay 15 to 50 eggs per day and up to 900 eggs in a lifetime. The entire life cycle of the fruit fly lasts about two weeks. Before mating takes place, the male fly first needs to court the female. The female will accept him only if he is an adult and from the same species that she is. The female recognises a male from the same species by means of her senses of sight, hearing and smell.

Assignment 9

The following sketch represents the life cycle of the fruit fly, but in the incorrect sequence. Place it in the correct sequence and then draw your own sketch of the complete metamorphosis of the fruit fly.

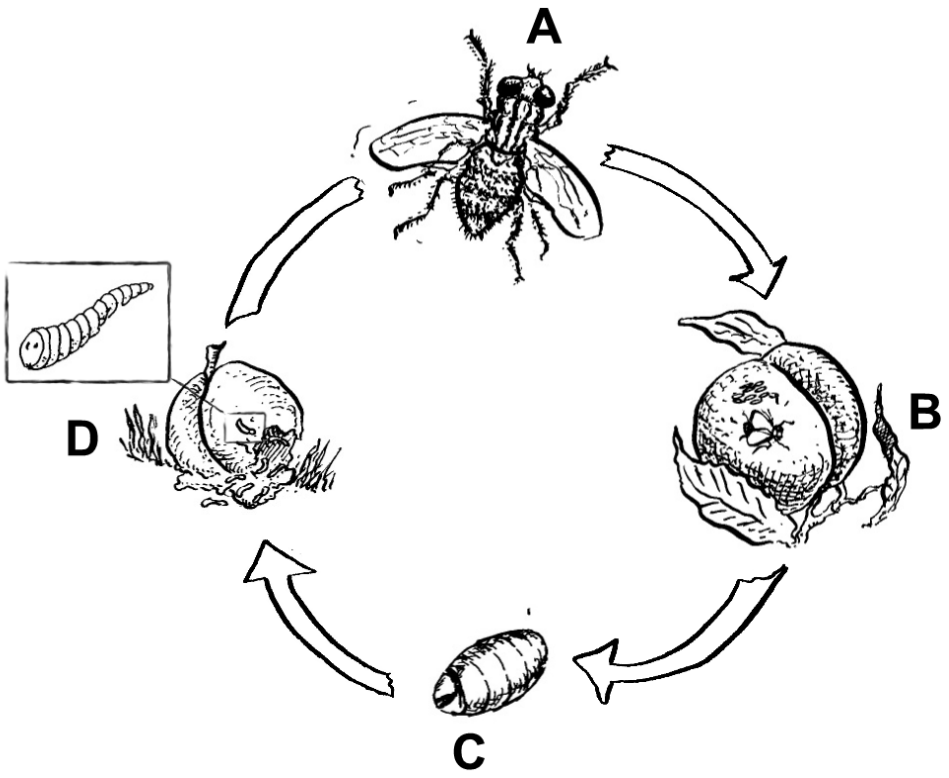


Figure 1.12

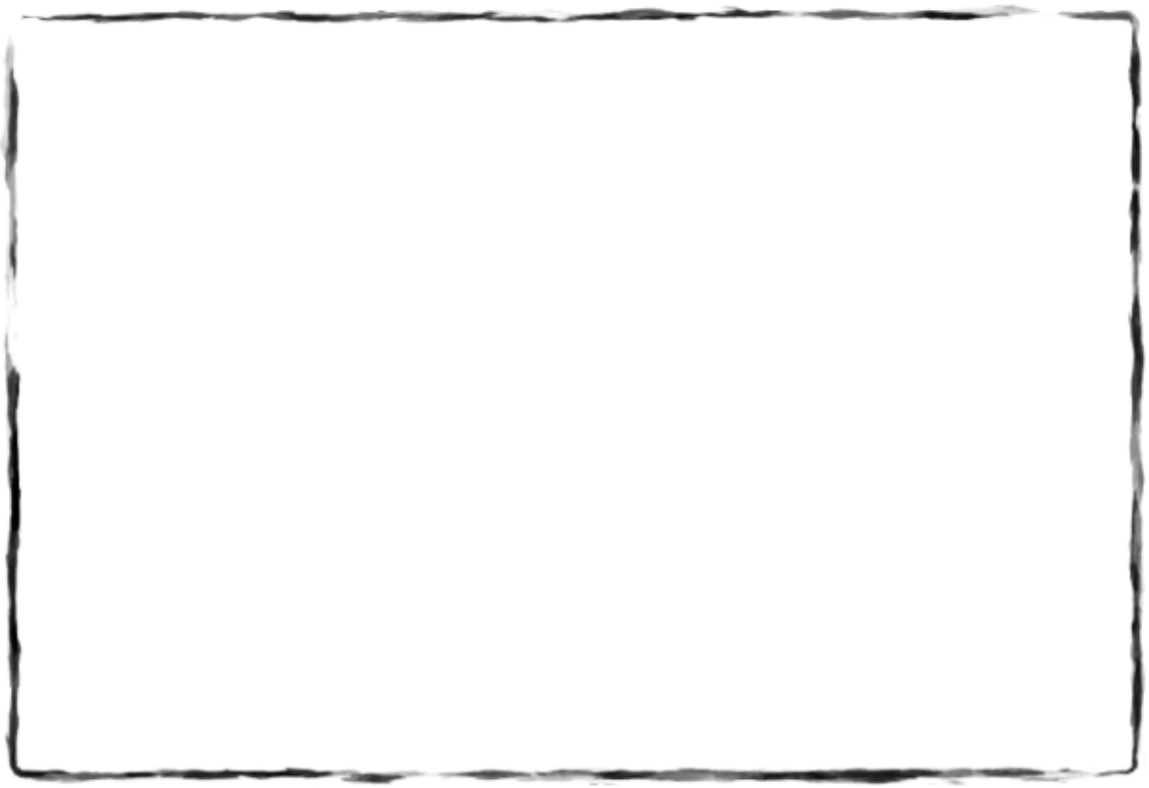


Figure 1.13

1.6.7.3 GROUP ASSESSMENT

CRITERIA	1	2	3	4
Correct sequence	_____	_____	_____	_____
Creative representation	_____	_____	_____	_____
Sketches/illustrations in proportion	_____	_____	_____	_____
Captions	_____	_____	_____	_____

Table 1.8

1.6.8 ASSESSMENT

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.7 To classify animals according to their feeding habits[7]

1.7.1 NATURAL SCIENCES

1.7.2 Ecosystems and the environmental balance

1.7.3

1.7.4 EDUCATOR SECTION

1.7.5 Memorandum

Assignment 10:
Cats: carnivore
Wild dogs: carnivore
Kudu: herbivore
Leopard: carnivore
Baboons: omnivore
Sheep: herbivore
Pigs: omnivore

1.7.6 LEANER SECTION

1.7.7 Content

1.7.7.1 ACTIVITY: To classify animals according to their feeding habits [LO 2.2]

(i) Consumers of food (animals) are also grouped according to their eating habits:
Macro-consumers include:
Herbivores (plant eaters), e.g. whales and goats
Carnivores (meat eaters), e.g. lions and snakes
Omnivores (plant and meat eaters), e.g. humans and rats

1.7.7.2 Assignment 10

Complete the table.

Herbivore	Carnivore	Omnivore	Animal
			cats
[U+F034]			
			wild dogs
			kudu
		[U+F034]	

continued on next page

[7] This content is available online at <http://cnx.org/content/m20145/1.1/>.

			leopards
			baboons
	[U+F034]		
			sheep
			pigs

Table 1.9

AMAZING:

- An organism is an individual plant or animal.
- Most animals spend the greatest part of the day searching for food and eating!
- Population is a group of individuals from a species living together in a certain area, e.g. Yellowwood trees, squirrels, fruit flies, marigolds and yellowfish.
- The teeth, paws, nose and ears of every animal are specially adapted to what it eats (especially the jaws, mouth and teeth!)

1.7.8 ASSESSMENT

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.2: We know this when the learner categorises information.

1.8 To distinguish between herbivores, carnivores and omnivores[8]

1.8.1 NATURAL SCIENCES

1.8.2 Ecosystems and the environmental balance

1.8.3

1.8.4 EDUCATOR SECTION

1.8.5 Memorandum

Assignment 11:

- Lion
- Blue whale (largest mammal)
- Bat
- Pangolin and hedgehog

What do you remember?

(i) An ecosystem is formed by all the living organisms that have a mutual influence on one another and on their environment

(ii) air; water; sun and soil

(iii) organism – matter – energy

(iv) plants (producer); caterpillars (primary consumers); birds (secondary consumers)

(iv) horse; elephant

(vi) Carnivores are meat eaters and herbivores are plant eaters

[8]This content is available online at <http://cnx.org/content/m20147/1.1/>.

1.8.6 Leaner Section

1.8.7 Content

1.8.7.1 ACTIVITY: To distinguish between herbivores, carnivores and omnivores [LO 1.2, LO 2.1, LO 2.2]

3. **MACROCONSUMERS**

(a) HERBIVORES

They eat seed-pods, grass, leaves and vegetables. They do not eat meat and therefore do not hunt. Instead, they are hunted by carnivores. Their bodies are adapted to suit their way of life and feeding habits.

They have large ears and can hear exceptionally well. Some of them have stripes (e.g. kudu, nyala, zebra, etc.) to camouflage themselves. Many carnivores only see shades of grey, black and white. As carnivores do not distinguish between colours, kudu and other buck can remain safe while they stand quite still when danger threatens.

Most plant-eaters have very good eye-sight, with the eyes set at the sides of the head, which gives them a wide field of vision. They also have a good sense of smell. Herbivores (e.g. kudu, rabbits, hares, locusts, springbuck, sheep, etc.) are constantly on guard against danger!

Assignment 11

Write a short report on one of the above-mentioned animals, describing its ears, eyes, sense of smell, food and enemies.

MY REPORT ON THE . . .

_____
_____
_____
_____
_____
_____
_____
_____

EDUCATOR'S ASSESSMENT

CRITERIA	1	2	3	4
Research done correctly	_____	_____	_____	_____
Data meaningful	_____	_____	_____	_____
Reporting complete	_____	_____	_____	_____

Table 1.10

(b) CARNIVORES

The largest group of carnivores are mammals, which include the cat family (wild cats, lions, leopards, tigers and domestic cats) and the dog family (wolves, foxes, jackals, wild dogs and domestic dogs).

They are hunters and can only eat once they have caught their prey (not the domestic dog). Carnivores hear and smell well and have strong, pointed jaws to snap at their prey and tear off chunks of flesh easily. Their eyes are situated in the front of their heads, so they can focus well and judge distance very accurately. They also have strong legs that enable them to be fast and agile when chasing their prey. They can run fast for long distances, without tiring.

Carnivores are found everywhere:

- on land
- in the sea

- among birds
- and in the insect world

Supply an appropriate example of each in the space provided!

(c) OMNIVORES

Omnivores eat a variety of foods, including meat and vegetables. Baboons, rats, cockroaches and people are all examples of omnivores.

They normally have small ears and eyes set in the front of their heads.

What do you remember?

SUMMATIVE: 10

(i) Explain the term ecosystem:

_____
_____
_____
_____

(1)

(ii) Name THREE examples of resources from the non-living environment:

_____
_____
_____
_____

(3)

(i) Complete the following diagram:

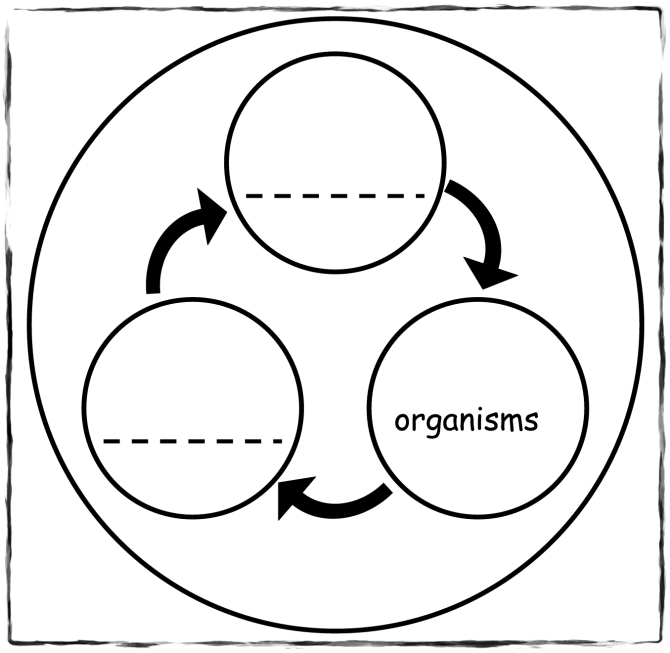


Figure 1.14

(2)

(iv) Rename the living organisms in the ecosystem:
Plants

_____
caterpillars

_____
birds

_____
hawks

_____
tertiary consumer

_____
(1)

(v) Name TWO examples of herbivores:

_____
_____
(2)

(vi) What is the difference between the food of carnivores and herbivores?

_____
_____
_____
_____
(1)

(vii) Choose an example of both a carnivore and omnivore and then answer the following questionnaire, in order to do a comparative study: (You may work in groups of 2 or 3)

Criteria	My example of a carnivore: _____	My example of an omnivore: _____
Position of the eyes	_____	_____
Size of the ears	_____	_____
Favourite food	_____	_____
Where and how is food acquired?	_____	
Describe the legs	_____	_____
Enemies? Who?	_____	_____
Rate the following senses as very good, good or bad and give reasons for your answers:		
Smell	_____	_____
Hearing	_____	_____
Sight	_____	_____

Table 1.11

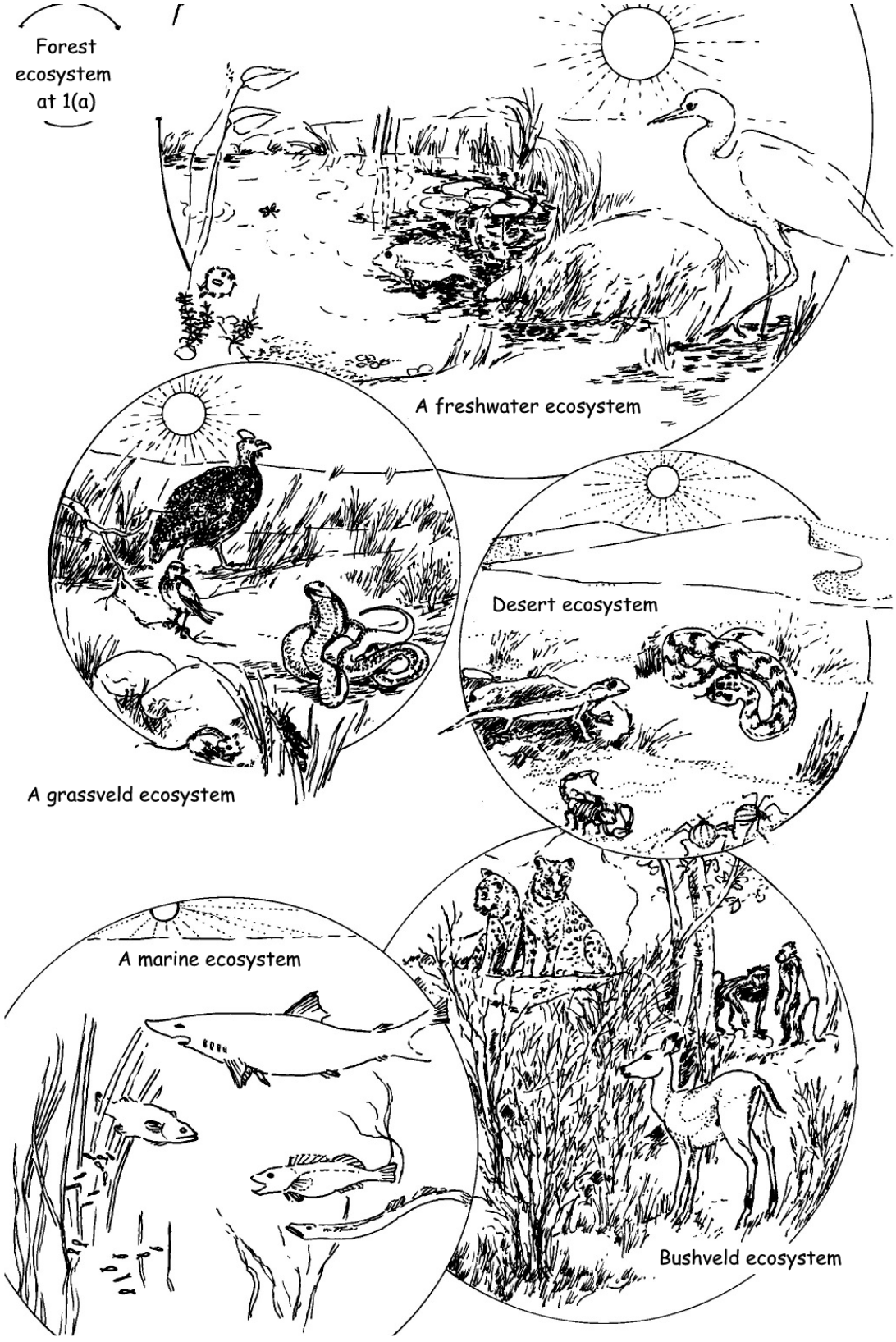

Forest ecosystem at 1(a)
A freshwater ecosystem
A grassveld ecosystem
Desert ecosystem
A marine ecosystem
Bushveld ecosystem

Figure 1.15

1.8.8 ASSESSMENT

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2: We know this when the learner leads investigations and gathers data.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1: We know this when the learner recalls meaningful information;

Assessment Standard 2.2: We know this when the learner categorises information.

1.9 To describe a neighbourhood ecosystem[9]

1.9.1 NATURAL SCIENCES

1.9.2 Ecosystems and the environmental balance

1.9.3

1.9.4 EDUCATOR SECTION

1.9.5 Memorandum

Assignment 12:

4. (d) The vegetation is influenced directly by the climate. The climate differs from place to place and therefore the vegetation also differs from region to region.

1.9.6 Leaner Section

1.9.7 Content

1.9.7.1 ACTIVITY: To describe a neighbourhood ecosystem [LO 1.1]

1. **ECOSYSTEMS**

(a) Make a careful study of various examples of ecosystems on the previous page. Professor Prove-It would like to know whether there are any existing ecosystems in your neighbourhood. It may be examples of ecosystems that are similar to those dealt with on the previous page, or different ecosystems.

I discovered the following ecosystems in my neighbourhood:

I discovered the following ecosystems in my neighbourhood:	
	_____
	_____
	_____
	_____

Table 1.12

[9]This content is available online at <http://cnx.org/content/m20152/1.1/>.

1.9.7.2 Assignment 12

(b) Write a short article describing an ecosystem of your choice which you discovered in your neighbourhood:

(c) Sketch your favourite example of an ecosystem below:

(d) Criticise or defend the following statement: "The vegetation in our country is exactly the same in all the different regions."

1.9.8 ASSESSMENT

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.1: We know this when the learner plans investigations.

1.10 To understand the concepts "biomes" and "symbioses"[10]

1.10.1 NATURAL SCIENCES

1.10.2 Ecosystems and the environmental balance

1.10.3

1.10.4 EDUCATOR SECTION

1.10.5 Memorandum

5. Antelopes: moderate grassland; subtropical grass and thorny bushes; bushveld
   proteas: fynbos
   ferns and mosses: moderate forests
   grasshoppers: semi-desert; moderate grassland; bushveld
   karoo bushes: semi-desert; dry semi-desert
   lions: bushveld; sub-tropical lowveld
   succulents: desert; semi-desert

[10]This content is available online at <http://cnx.org/content/m20153/1.1/>.

1.10.6 Leaner Section

1.10.7 Content

1.10.7.1 ACTIVITY: To understand the concepts "biomes" and "symbioses" [LO 1.1]

1. **BIOMES**

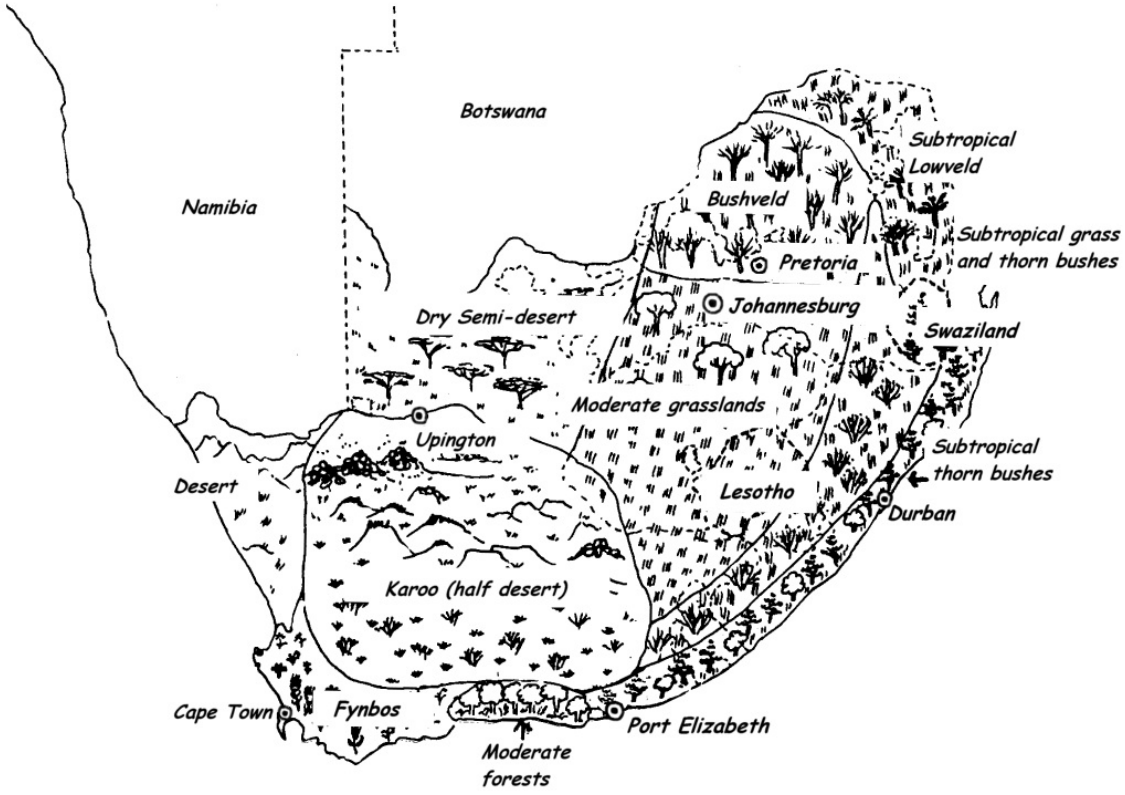


Figure 1.16

Within the biosphere the climate differs from place to place, and there are many natural regions, each with its own characteristic plant and animal species, as illustrated in the map above. The natural regions are called biomes. (You will learn more about it later).

A continuous interaction takes place between the living and non-living organisms in each biome.

In which region(s) would one find plenty of?

Buck_____

proteas _____

ferns and mosses_____

locusts _____

karoo bushes_____

lions_____

succulents_____

What an animal eats, determines where it lives! Antelope that feed on the leaves and young offshoots of trees, will not be found in places where the vegetation is mainly bushes and shrubs. One will not find

leopards and lions where there are no antelope.

(a) What an animal eats, determines where it lives

Some birds cannot stay in one habitat all year round, because trees shed their leaves because of weather patterns. One such species is the swallow. To overcome this problem, swallows therefore migrate to countries where it is summer and return again after winter.

Assignment 13

Write a short paragraph on the migration of the swallow. Indicate whether it is an annual occurrence, and also how the migration takes place and what problems the birds experience during their migration.

The diet of an Eskimo living near the North Pole mainly consists of seal-meat, fish and birds. All these sources are dependent on small plants which grow in the sea. But how is this possible?

Seals and birds feed on fish. The fish eat smaller fish. Little fish feed on shrimp, whilst the shrimp feed on microscopic plants called diatoms, which live on the surface of the sea. These plants produce their own food through the process of photosynthesis.

Complete the long chain of who eats whom:

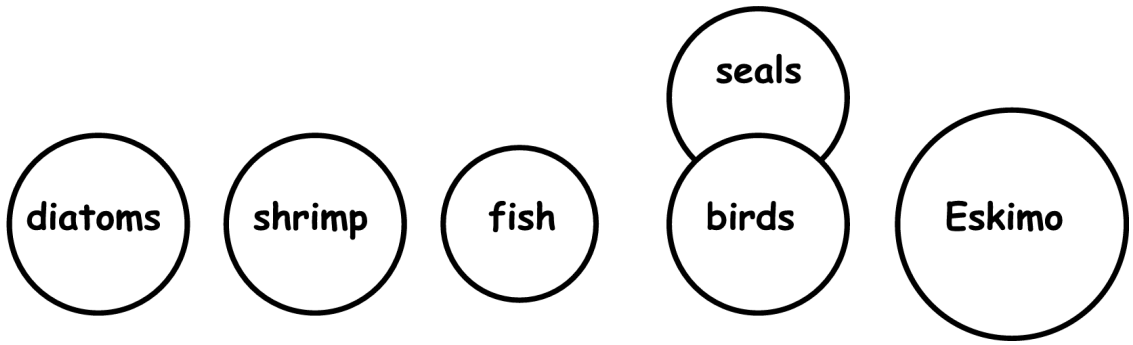


Figure 1.17

Ecologists call the transfer of food energy from a source to numerous organisms feeding successively on each other, a food chain.

(b) Symbiosis

The symbiosis relates to the cohabiting of plants and animals to the advantage of one another. The story of mangroves and crabs is probably one of the nicest stories of symbiosis between plants and animals. Mangroves especially grow in the salty water where rivers discharge into the ocean. The soil there is very poor, muddy, without air and salty. Fortunately there are also crabs that live in the muddy estuaries. One such crab, the mangrove crab, survives on dead leaves which they store in tunnels. These crabs make holes

and tunnels in the mud and manufacture humus of good quality from the decomposed leaves. There is, however, one problem that they had to overcome, and that is the fact that the trees only shed their leaves in autumn. During the other seasons there weren't leaves for the crabs to use. The mangroves therefore changed their leaf shedding habits. They don't shed all their leaves at the same time, but throughout the year. In this way they live together to the advantage of one another.

Assignment 14

Do research on any other interesting form of symbiosis between animal and plant. Write a short report (one folio) or make a sketch that depicts symbiosis.

CRITERIA	**1**	**2**	**3**	**4**	**5**
Indication of two organisms	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
Reasons for symbiosis	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
Language / captions with sketch	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
Neatness and layout	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
Element of interest	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _

Table 1.13

Consider another food chain more familiar to us.

In a field green plants are eaten by meadow mice, which in turn fall prey to hawks.

Image not finished
The hawk is a secondary consumer.
Image not finished
The mouse is a primary consumer, because it is the first to eat the plants.
Image not finished
The green plants are the producers.

Table 1.14

The concept of producer and consumer is very helpful in nature because it reminds us that food is not manufactured in canneries or frozen-food factories out there.

1.10.8 ASSESSMENT

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.1: We know this when the learner plans investigations.

1.11 To study the important role of plants in the ecosystem[11]

1.11.1 NATURAL SCIENCES

1.11.2 Ecosystems and the environmental balance

1.11.3

1.11.4 EDUCATOR SECTION

1.11.5 Memorandum

Assignment 15:

1. Plants and animals die
2. Plants and animals produce waste material
3. Decomposers degrade the waste material and use some parts of it as food
4. Other parts are degraded as chemicals and then released into the air or soil
5. The chemicals are absorbed by other plants and taken up into the food chain

1.11.6 LEANER SECTION

1.11.7 Content

1.11.7.1 ACTIVITY: To study the important role of plants in the ecosystem [LO 1.2, LO 2.3]

Plants (producers) simply take non-living material (water, sunlight, carbon dioxide and minerals) and produce plant food. This process is called photosynthesis, of which you will learn a great deal in the next module. Oxygen is released simultaneously.

Design two more food chains with plants as the producers.

[11] This content is available online at <http://cnx.org/content/m20154/1.1/>.

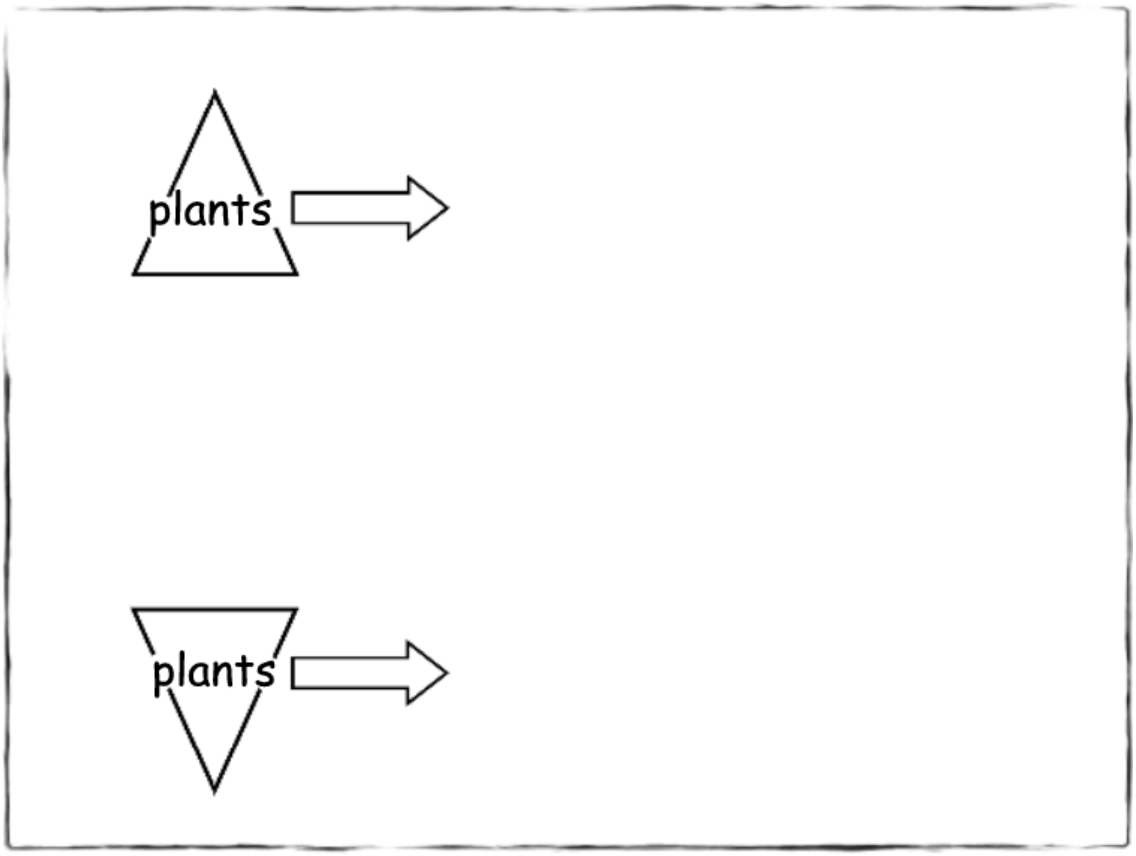


Figure 1.18

(a) The role of fungi in the ecosystem

Fungi are regarded as the "poor" family members of the plant kingdom because they do not contain green colouring. The green colouring, chlorophyll, enables green plants to produce their own food from carbon dioxide and water. Green plants are therefore self-sufficient and do not depend on other living things for food. Fungi and bacteria, on the contrary, are as dependent as animals on the food that plants have to prepare for them.

When a plant or an animal dies, the energy stored in them is not lost. Microscopic fungi and bacteria live on the dead bodies and thereby break them down. In this way, such dead material becomes part of the soil once more. Plants that do this are called decomposers because of the unique role they play in nature.

Assignment 15

Study the following diagrammatic representation of the process of decay. It shows how dead organisms are broken down and recycled by decomposers. Read the captions that are provided below and copy them into the appropriate spaces. Take note of the fact that the captions are not given in the correct order:

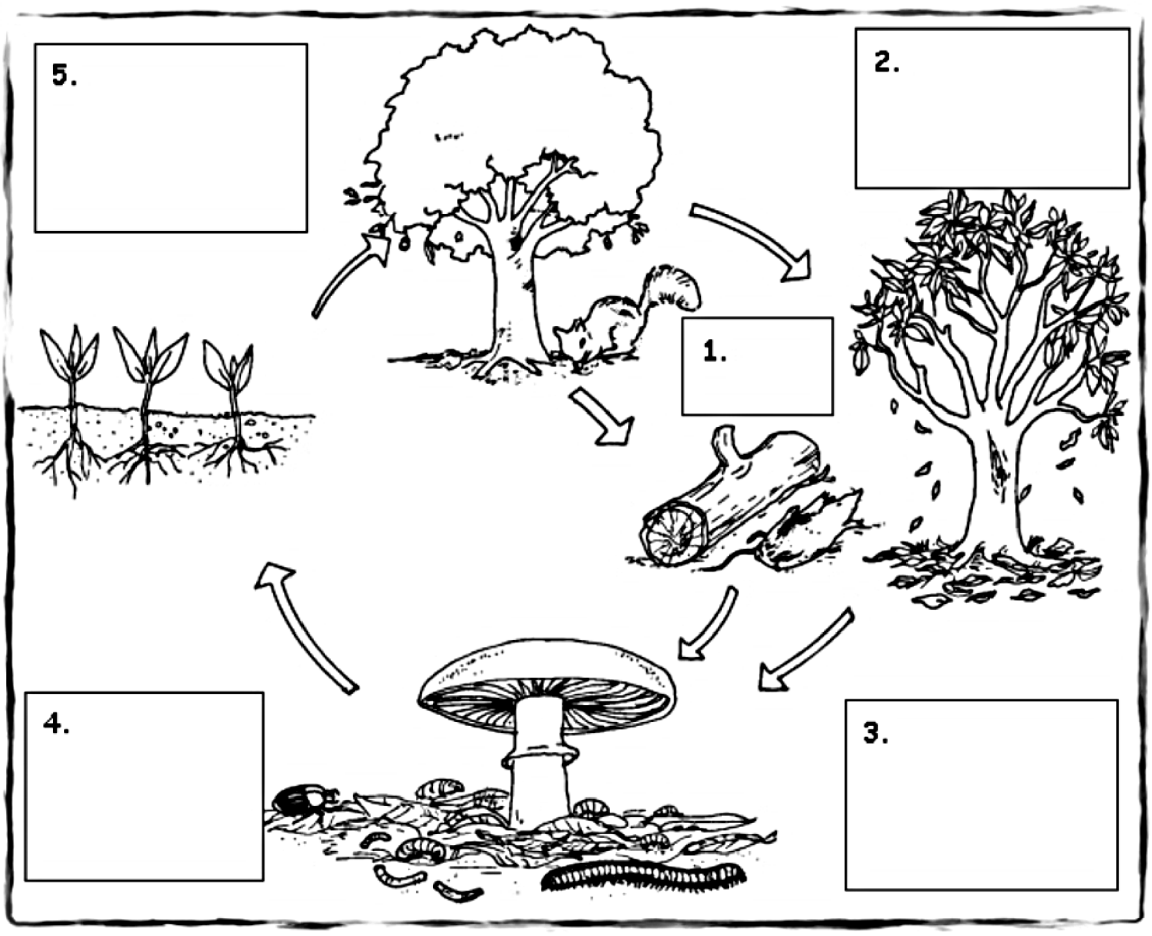


Figure 1.19

- Plants and animals produce waste material, e.g. leaves.
- Decomposers break down the waste material and use part of it as food.
- Other parts are broken down into chemicals and are released into the air or the soil.
- Plants and animals die.
- The chemicals are absorbed by other plants and are again taken up into the food chain.

(i) The structure of fungi

Fungi consist of branched threads that may be divided into sections (e.g. bread mould) or may be combined in a large, solid body (e.g. mushrooms). Many fungi are edible, but some are extremely poisonous. It is much safer to eat well-known mushrooms only. The mushroom is pushed up from below the soil as a small, round button. When it grows bigger, it stretches out on a stem and eventually opens up like an umbrella.

Below the umbrella the spore-bearing gills radiate from the stem. In the common edible button mushrooms these gills are pale pink when the fungus is young and become blackish-brown as the fungus matures. None of the poisonous toadstools have this colour, so the colour provides the best indication to whether you are dealing with a poisonous toadstool or an edible mushroom. One should never eat a fungus that looks like a mushroom but has white gills, because this could lead to death.

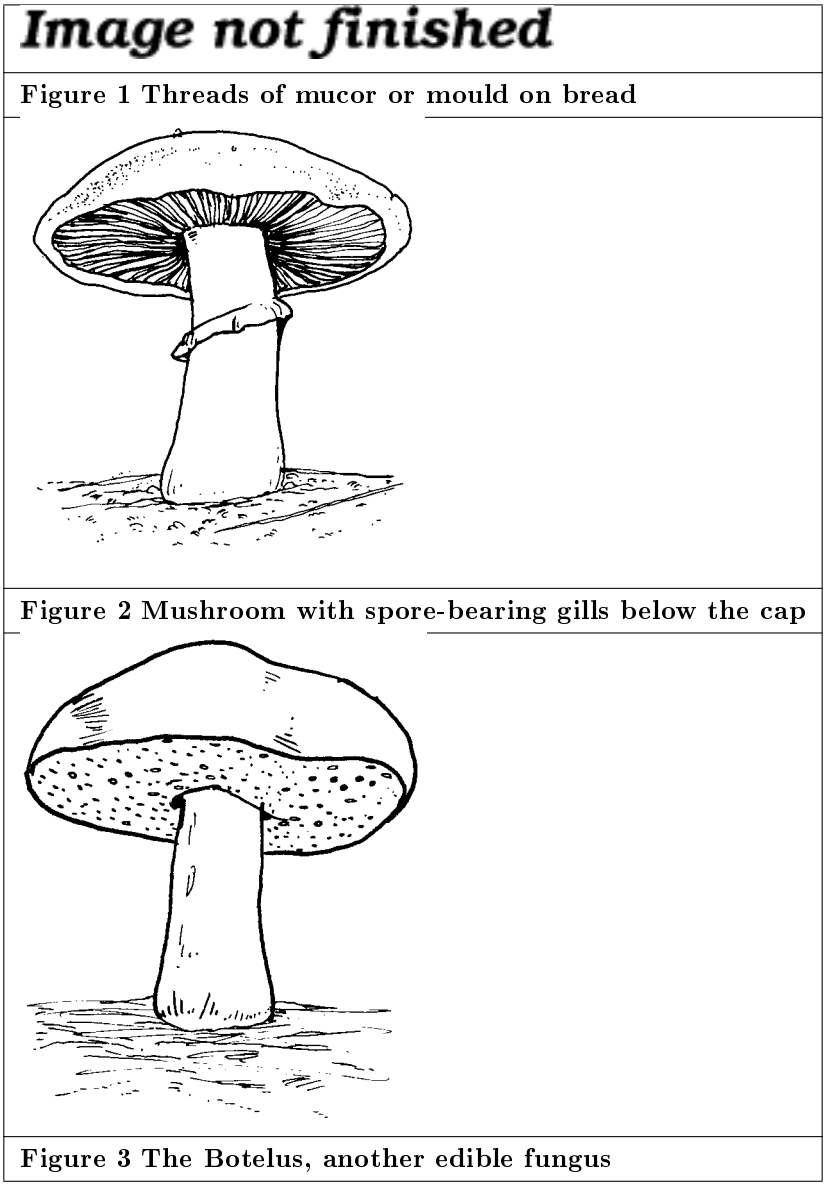


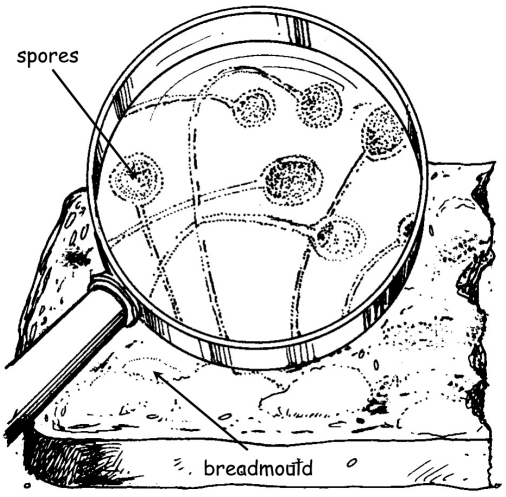
Figure 1 Threads of mucor or mould on bread

Figure 2 Mushroom with spore-bearing gills below the cap

Figure 3 The Botelus, another edible fungus

Table 1.15

When you examine fungi under a microscope, you will see many threads growing in all directions, almost like an untidy cobweb. Each thread is branched, like a tree, and each branch has a further range of branches. Small round knobs are visible at the ends of some branches. These little knobs are containers, because they actually are hollow and are full of small seeds. These are called spores. They are so very small that a thousand of them will fit onto the head of a pin. Fungi are different from other plants in that they do not need light for regeneration, but they do need air, food and water. People do not need to plant the seeds of fungi as spores will simply begin growing wherever there is food, air and moisture, for instance on a damp towel. The skin of fruit is also always infested with spores, but they will not develop while the fruit is kept dry.



Fungi under the microscope

Figure 1.20

Assignment 16

Cultivating Bread Mould

You will be cultivating fungi now. Take two slices of white bread. Break them in half. Wipe each piece of bread along the floor or across a windowsill to pick up some spores. Now sprinkle water on the bread, but take care not to wet it too much or the bread will break. Place each piece of bread in an airtight container, and screw on the lid. Place the containers in a warm, dark cupboard. The spores will have all that they need, namely food (the bread), water and the air that is trapped in the container. Warmth is not necessary, but will encourage faster growth of the spores. Take the containers out of the cupboard after three days and examine them to answer the following questions:

CONTROL	**YES**	**NO**
Did I execute the experiment with care?	_ _ _ _ _ _	_ _ _ _ _ _
Was my experiment successful?	_ _ _ _ _ _	_ _ _ _ _ _
Did a downy, white growth develop on the bread?	_ _ _ _ _ _	_ _ _ _ _ _

continued on next page

Did black spores like grains of pepper occur in the bread mould?	______	______
Give a possible reason, if necessary, for the lack of success of the experiment: ______________________________ ______________________________ ______________________________ ______________________________ ______________________________ ______________________________		

Table 1.16

(ii) Usefulness for people

Except for the fact that people use some fungi as food, fungi are also used as medication. A fungus that has become a wonderful friend to people, namely Penicillium, kills harmful bacteria in the human body.

Figure 1.21

The best-known fungus of those used by people probably is the yeast fungus that is used in wine making.

Assignment 17

Do some research to find out how the yeast fungus manages to make wine. Write two paragraphs on how this fungus operates and on other useful ways of using the fungus.

____
____
____
____

The food chain therefore is an endless process.

Food is the medium through which materials, to construct body tissues, are acquired. In this way energy for life is passed on along the chain!

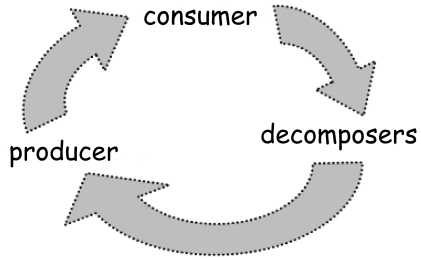


Figure 1.22

1.11.8 ASSESSMENT

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2: We know this when the learner We know this when the learner leads investigations and gathers data.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.12 To understand the natural balance between living organisms and available sources[12]

1.12.1 NATURAL SCIENCES

1.12.2 Ecosystems and the environmental balance

1.12.3

1.12.4 EDUCATOR SECTION

1.12.5 Memorandum

Assignment 18:

Bryophytes (mosses) are extremely adaptable;

Mosses are extremely adaptable, because they survive in a variety of environments. Mosses are even able to adapt to different climatic regions. They can adapt to moist environments, dry environments and even to dark environments. Some of the tough species are even found in the crevices on volcanoes.

a) It is very dense and can seal the wound so that no germs can enter; it was found in abundance and was easy to obtain.

b) Human influence: Extermination of animals

Natural disasters; droughts; floods

True or false:

7.

(a) True

(b) True

(c) False

(d) As soon as the seeds germinate, the rats invade the sugar plantations and eat the seeds

(e) Simultaneous means one at a time and not everything together.

1.12.6 LEANER SECTION

1.12.7 Content

1.12.7.1 ACTIVITY: To understand the natural balance between living organisms and available sources [LO 2.3]

1. **FOOD WEBS**

A link in one chain is often joined to other links in other chains. Isolated food chains are very rare in nature. An interconnected series of food chains is called a food web.

[12] This content is available online at <http://cnx.org/content/m20155/1.1/>.

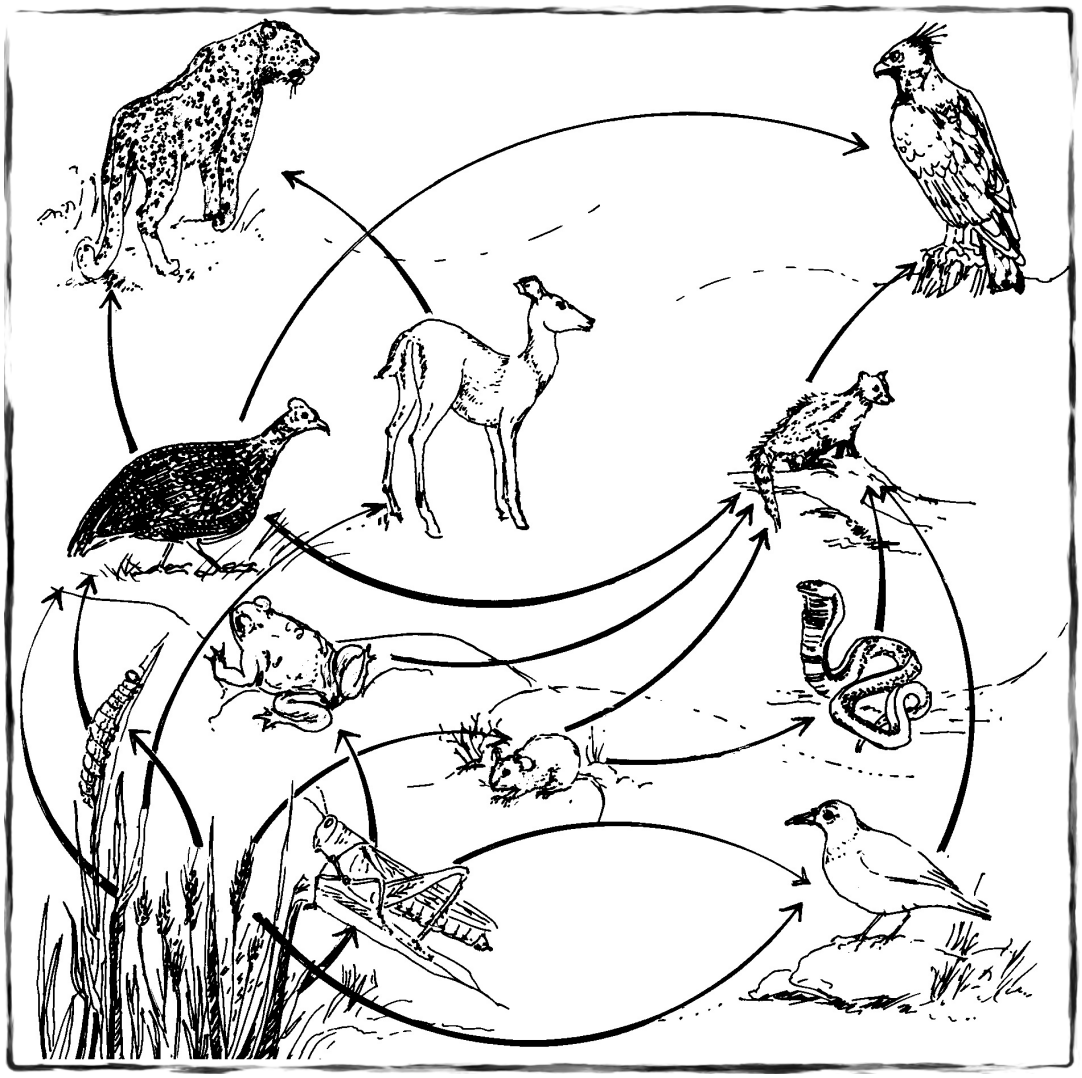


Figure 1.23

Study the above example of a food web showing links between various food chains. The herbivores are eaten by both the carnivores and omnivores.

Energy, however, is lost each time one organism is eaten by another. The plant provides energy for the buck to run or breathe. That energy is no longer available to another organism.

The shorter a food chain, the greater the number of organisms able to live in a fixed area.

Identify as many food chains as possible in the illustration on the previous page and illustrate them by means of words and arrows:

_____

_____

_____

_____

_____

(a) **Harmony in the ecosystem**

In a natural ecosystem living organisms live in harmony. Plants and animals are both affected by the environment and also influence it in turn. There is a natural balance between the available resources and the organisms which rely on it.

(i) **Growth of plants of the same species in different conditions**

The climate in a particular region determines the type of vegetation. Plants from the same species grow and develop differently under different climatic conditions.

Sometimes, when walking in a forest or along a river, you will find yourself walking on a dense green "carpet". This "carpet" clings to the ground and is called moss. It grows in a variety of places, amongst others on barks, branches of plants and even on dead logs. It is also found on damp soil near rivers or lakes and some kinds of moss also grow on rocks and cement. This plant species consists of more that 350 000 different plants.

The structure of the moss plant is more complicated than that of fungi, but simpler than that of trees or flowers. Mosses have chlorophyll and can therefore, through the process of photosynthesis, produce their own food. Mosses, however, do not propagate by means of seeds, but by means of spores.

Are you able to identify one DIFFERENCE and one SIMILARITY between mosses and fungi?

(ii) **Growth of moss in damp environments**

All plants need water to survive. Many kinds of moss get moisture form the air and are therefore found near water (rivers) or in areas with high rainfall. The mosses flourish in such circumstances and sometimes form a dense green "curtain".

As these mosses do not have to get their moisture from the soil, they can grow on different surfaces. They attach themselves to barks, bricks, rocks and cement and even grow on thatched roofs. Moss that grows on a rocky surface has a network of stems and leaves.

(iii) **Growth of moss in drier environments**

Some mosses can survive in deserts, because they can do without water for long periods of time. Without water they become very dry, the leaves roll up and then turn black or brown. Some of these mosses can survive for as long as 10 years without water. When the rains eventually come, their green colour returns and they start growing again.

A tough kind of moss, Decranella heteromalla, is even found in the cracks of volcanoes.

(iv) **Growth of moss in dark environments**

Some kinds of mosses that grow in dark places like caves, have a very special characteristic: they glow in the dark. Their plant bodies contain cells like lenses which reflect light. Because of this they are sometimes called "ghost gold".

Discuss with your friend: Is "ghost gold" an original name for this kind of moss?

Assignment 18

Evaluate the following statement: Moss plants are very adaptable. Write a short paragraph in which you evaluate this statement. Motivate your finding.

(a) During World War II a certain moss plant was used as a dressing for wounds.

Supply two possible reasons for this:

The number of wild animals which inhabit a habitat over a long period of time are termed the carrying capacity. This differs from habitat to habitat depending on the animals that live there and on what they eat.

The slightest disturbance in this delicate balance, will cause a chain reaction in the ecosystem, affecting all the plants and animals.

The establishment of a new living area and the cultivation of crops can cause a chain reaction and do a great deal of damage to an ecosystem.

Name 2 more disturbances which will cause an imbalance in an ecosystem

2. **INTERESTING**

The number of mice in a particular area depends on the availability of seeds to be eaten. In turn, the number of mice determine how many kestrel can live in the area, as they feed on mice.

A certain plant which grows in forests from Natal to Mozambique grows very slowly for the first few years. After 6 years it becomes the dominant plant in the undergrowth. If conditions become favourable (after 7 years) all plants in the forest flower simultaneously. Enough seeds are dispersed and all the plants die. It remains an enigma why the flowering (which so seldom occurs) is followed by death.

After the plants have died there is so much dry material on the forest floor that there is danger of destructive fires. While the plants are in flower the bee-swarms in the forest increase. People visit the forests to rob the hives.

The increase in bees leads to an increase in the number of birds that feed on bees. As the seeds fall to the ground, the number of rats increase to eat it, which in turn results in an increase of small hawks and owls.

When the seeds germinate the rats leave the forest in large numbers and invade the sugar-cane fields. Here they do so much damage that people are obliged to send their cats into the affected areas.

We cannot say what happens to the birds, hawks, owls and cats but this proves that the behaviour of one organism can affect all kinds of other organisms. The relationships between organisms and environments are therefore very complex.

True or false:

(a) Certain plants take many years before flowering.

(b) Birds eat bees.

(c) The change in behaviour of one organism will not affect the others.

Why do rats invade the sugar plantations?

(d) Select and write down an incorrect statement from among those given below:

- · The number of animals living in a particular area depends on the amount of available food.
- · Dry seeds, leaves and twigs can cause fires, if ignited.
- · Simultaneously means 'one-by-one', not all at the same time.
- · Hawks and owls enjoy catching rats.

3. **BIOSPHERE**

Our environment provides something without which we cannot live, namely natural resources and non-living matter. We need natural resources such as sunlight, fresh air and soil.

From space, planet Earth is seen as a small blue sphere. A closer view, however, reveals that life on earth is only confined to a thin layer (approximately 80 km thick) of water, soil and air. This layer, stretching from the depths of the ocean to the atmosphere, is referred to as a biosphere (living space).

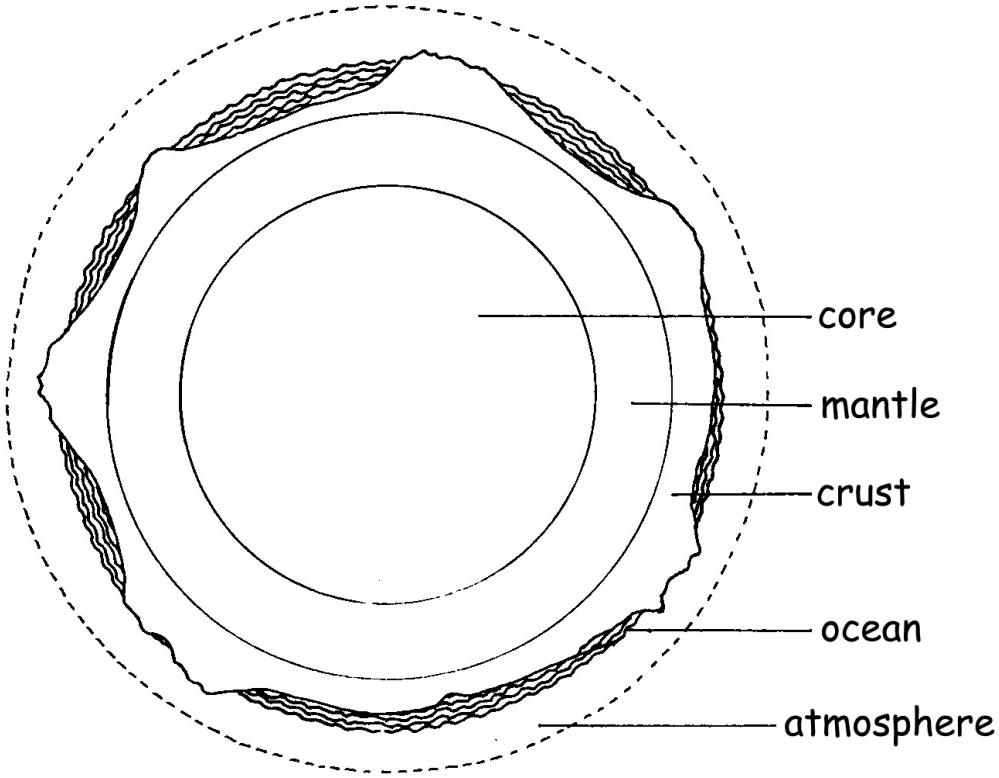


Figure 1.24

1.12.8 ASSESSMENT

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.13 To cultivate a positive altitude towards the environment and natural resources[13]

1.13.1 NATURAL SCIENCES

1.13.2 Ecosystems and the environmental balance

1.13.3

1.13.4 EDUCATOR SECTION

1.13.5 Memorandum

9.

(a) water; soil and vegetation

1.13.6 LEANER SECTION

1.13.7 Content

1.13.7.1 ACTIVITY: To cultivate a positive altitude towards the environment and natural resources [LO 1.3, LO 2.3]

1. The influence of humans on the ecosystem

Humans continuously interact with the ecosystem in which they live. The interaction is associated with human survival and humans striving to improve their living conditions. Sometimes humans succeed in improving their situation, but in many cases they have simply disturbed the ecosystem.

Until recently we expected natural resources to be unlimited, but we now realise that we were wrong.

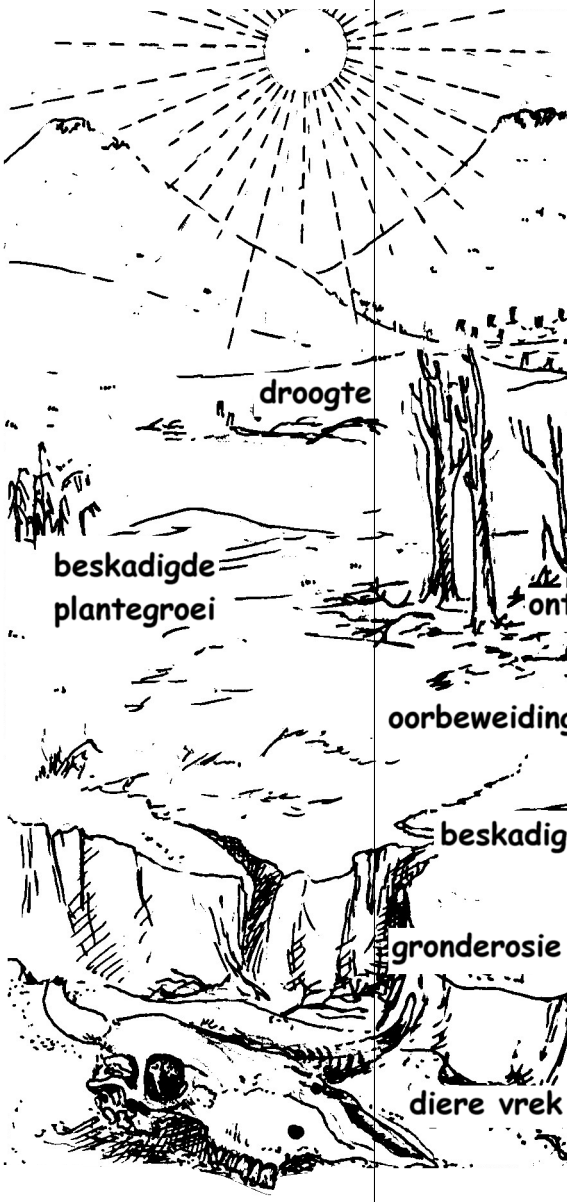
(a) Name THREE natural resources which have been badly exploited:

_____
_____
_____
_____
_____
_____
_____
_____
_____

(b) Study the sketch illustrating a damaged ecosystem (next page). Next to it, using the information, sketch the same representation of the ecosystem, but show it in harmony!

		Hungry people
		continued on next page

[13]This content is available online at <http://cnx.org/content/m20156/1.1/>.

Good managementof natural resources		Poor managementof natural resources
		

continued on next page

An ecosystem in harmony		A damaged ecosystem

Table 1.17

People easily disturb the environmental balance of an unspoilt area. Therefore we have a responsibility to strive for harmony in nature, by preserving and restoring the environment. This responsibility can only be met once people adopt the proper attitude towards nature.

1.13.8 ASSESSMENT

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.3: We know this when the learner evaluates data and gives feedback on findings.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.14 Term 2

1.14.1 To be able to give an overview of energy forms and sources[14]

1.14.1.1 NATURAL SCIENCES

1.14.1.2 Planet earth and the universe

1.14.1.3 Different forms of Energy

1.14.1.4

1.14.1.5 EDUCATOR SECTION

1.14.1.6 Memorandum

Memory chart:
Kinetic energy: wind and water
Chemical energy: food
Thermal energy: sun
Electrical energy: cells, batteries, dynamos, power stations
Light energy: sun

1.14.1.7 LEARNER SECTION

1.14.1.8 Content

1.14.1.8.1 Activity: To be able to give an overview of energy forms and sources [LO 2.1]

- The body needs fuel in the form of food to continue to exist. Energy stored in food is known as chemical energy. This provides the body with the energy that is needed for living, eating, sleeping, running, learning and thinking.

There are many forms of energy besides chemical energy. Thermal energy and light energy are mainly obtained from the sun. Kinetic energy is obtained when moving water is harnessed to turn a water wheel or when moving air (wind) turns a wind pump.

[14]This content is available online at <http://cnx.org/content/m20159/1.1/>.

Sound energy is created by vibrating objects, e.g. the strings of a guitar.

Electrical energy is the form of energy that is used most often in normal life. Electrical energy is created with the help of dynamos. It is a very convenient form of energy as it can be transported by means of wires over many kilometres. Electrical energy can also be obtained from cells (e.g. torch cells) or batteries.

Refer to the introductory paragraph and complete the mind map by providing the source of each kind of energy.

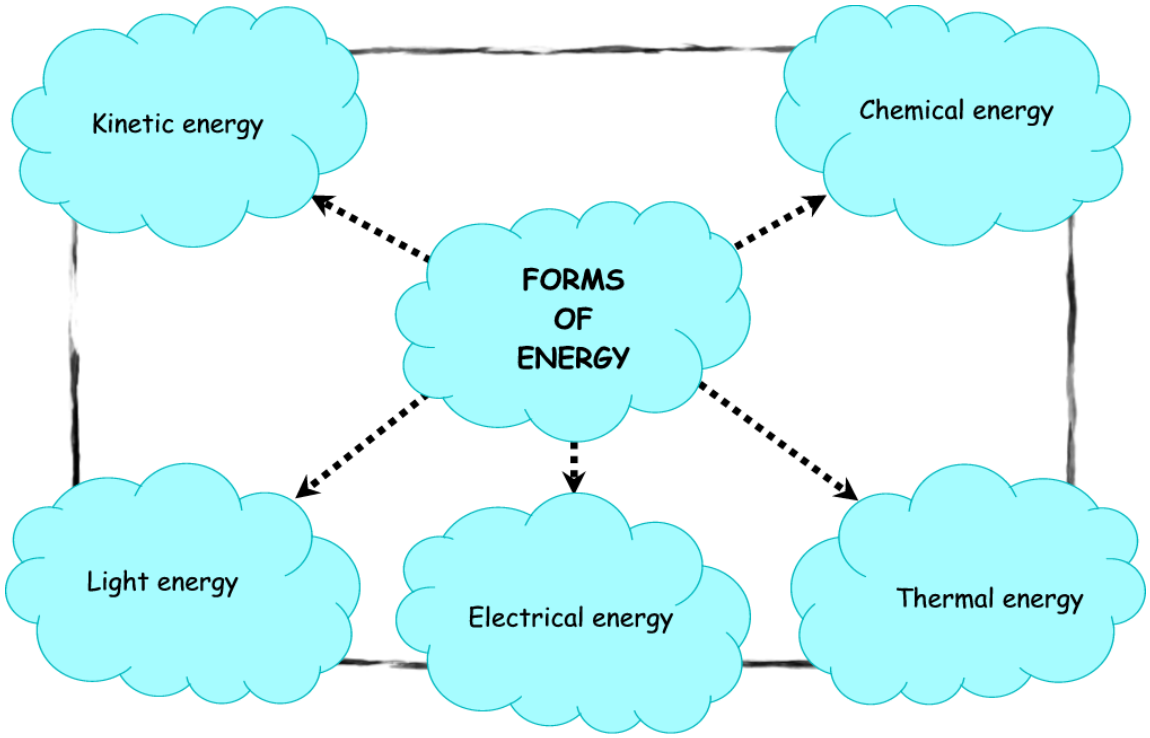


Figure 1.25

1.14.1.9 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1: We know this when the learner recalls significant information.

1.14.2 To be able to discuss chemical energy as a source of energy[15]

1.14.2.1 NATURAL SCIENCES

1.14.2.2 Planet earth and the universe

1.14.2.3 Different forms of Energy

1.14.2.4 EDUCATOR SECTION

1.14.2.5 Memorandum

Assignment 1:

Make sure that the learners are able to read the block diagram. Accept their own combinations, but make sure that they come as close to 11 760kJ as possible. Food combinations must also be acceptable. For example, a choice of beans and ice cream is less acceptable than 3 slices of chicken and baked beans.

1.14.2.6 LEARNER SECTION

1.14.2.7 Content

1.14.2.7.1 ACTIVITY: To be able to discuss chemical energy as a source of energy [LO 2.3]

THE SUN AS A SOURCE OF ENERGY

- The estimated temperature of the sun is approximately 20 000 000° C. The sun has been supplying plants and animals on the earth with energy for millions of years. Unfortunately, most of this energy goes to waste because we have not found a way for large-scale conservation of energy for later use.

PLANTS AS DETERMINANTS OF SOLAR ENERGY

- Plants, however, store this energy effectively. The sun's energy is converted to another form of energy in the leaves of plants. The process during which this occurs is known as photosynthesis.

[15] This content is available online at <http://cnx.org/content/m20160/1.1/>.

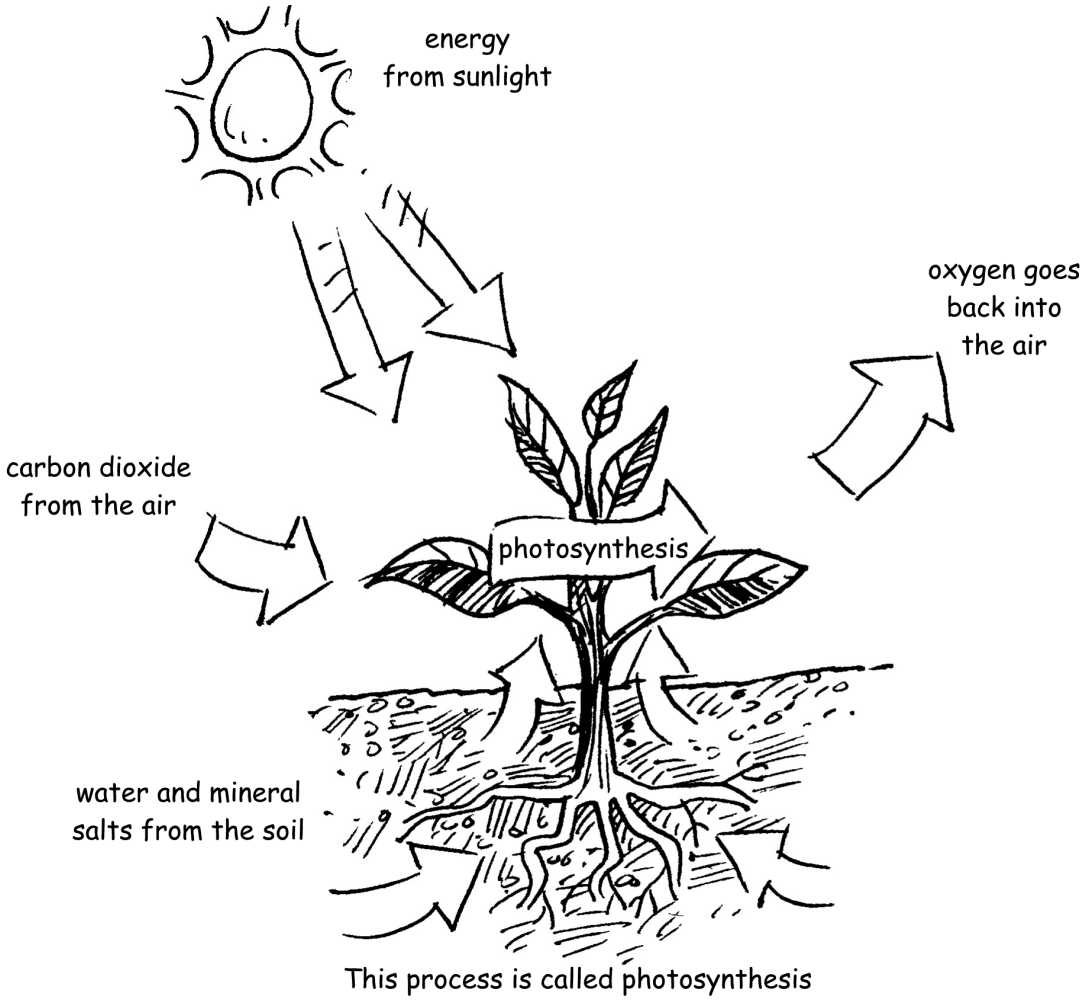


Figure 1.26

Plants store this energy in the form of carbohydrates. By following a balanced diet, we are able to take in enough energy of plant and animal origin to conduct our daily business with sufficient keenness and enthusiasm. If we do not have enough energy, we feel weary and listless.

FOOD AS A STORE FOR ENERGY IN CHEMICAL FORM

- We measure the amount of energy contained in foodstuffs in kilojoules (kJ). We can determine how much energy we absorb by taking note of the information on the labels of food products.

The block graph that follows shows the kilojoules content of a number of foods. Twelve-year olds with an average mass of 40 kg need approximately 11 760 kJ per day.

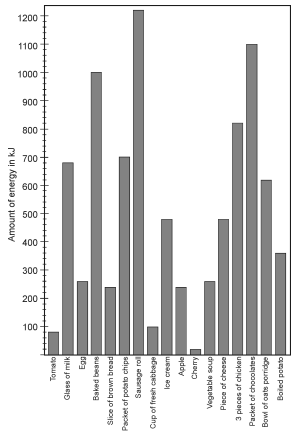


Figure 1.27

Types of food

Refer to the graph and work out what the average twelve-year old learner should eat per day to have enough energy. It is important to understand the calibration (the scale division) of the graph before attempting to determine this.

A DIET FOR ONE DAY!!

____
____
____
____

EDUCATOR'S CRITERIA FOR ASSESSMENT	1	2	3	4
Calibration interpreted correctly	___	___	___	___
Full kJ count (11 760 kJ)	___	___	___	___
Sensible food combinations	___	___	___	___
Use of full and half or quarter portions	___	___	___	___

Table 1.18

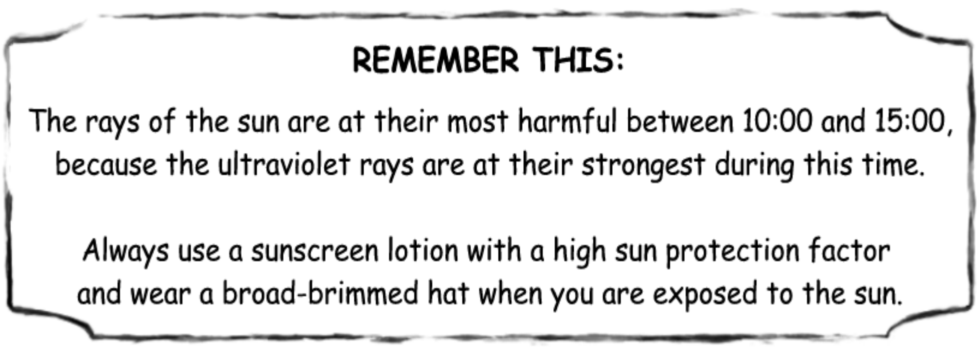


Figure 1.28

1.14.2.8 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.14.3 To be able to investigate and describe two examples of kinetic energy[16]

1.14.3.1 NATURAL SCIENCES

1.14.3.2 Planet earth and the universe

1.14.3.3 Different forms of Energy

1.14.3.4 EDUCATOR SECTION

1.14.3.5 Memorandum

1. Determine whether the learners understand the main points (in other words, not merely a summary of the first paragraph of the handbook):

[16]This content is available online at <http://cnx.org/content/m20205/1.1/>.

4 the heat comes in through the window

4 the screen increases the amount of light that comes in

4 the bright inner surface prevents loss through rays and conduction

4 the same applies for the padded sides

4 the black outer surface prevents eradiation

2. This is an opportunity for learners to reason on their own as to how the device can be improved further, for example by making a hole in which a thermometer will fit snugly so that the bulb is on the inside, while the scale is still legible on the outside. In whatever way it is devised, it must not be necessary to open the door.

3. Accept the learners' readings.

4. For example sun panels, windows of the house face towards the sunny side (north in SA), drying washing (instead of using a tumble drier which consumes electricity), build swimming-pool where there is not too much shade, allow bread dough to rise in a sunny spot, etc.

1. For example:

Van Rooyen says that there were many bird deaths in other countries where wind power is utilized. In California, USA, up to 300 birds per year die on the so-called wind farms. In the Alatamont Pass in California USA only 13% of the turbines are responsible for deaths.

Scott says there are more incidents abroad, because more turbines have been erected there than in South Africa.

2. Not much endangered.

3. Allow learners to report their information in the tables and allow a class discussion.

1.14.3.6 Leaner Section

1.14.3.7 Content

1.14.3.7.1 ACTIVITY: To be able to investigate and describe two examples of kinetic energy [LO 1.2, LO 1.3]

- WIND POWER

Rapport of 5 January 2003 reported that bird lovers are concerned about the number of birds that die due to wind power turbines worldwide. Mr Chris van Rooyen of the Trust for Endangered Wild Life however, gave the assurance that the wind power experiment near Darling holds no real danger for bird life.

Read the report and answer the questions that follow:

WIND POWER DOES NOT ENDANGER BIRDS

EXPERIMENT CONDUCTED AWAY FROM FIXED FLIGHT ROUTES

South Africa's first experiment with wind power does not really endanger any bird life.

This assurance comes from Mr Chris van Rooyen of the Trust for Endangered Wild Life in response to bird lovers who have quoted international statistics on bird mortality in the vicinity of wind power turbines.

Escom erected two enormous turbines – each about 60 m in height and with three blades, each one as long as a tennis court and weighing approximately 3 tons – in the vicinity of Darling on the West Coast.

The turbines are part of research being conducted to determine whether it would be feasible to supply electricity from wind power – a renewable resource that incurs no pollution.

The turbines together hardly supply 3,2 MW of power.

Van Rooyen says that other countries in which wind power is harnessed have recorded a considerable bird mortality rate. In California, USA, approximately 300 birds die annually on the so-called wind farms.

He says however that this is mainly due to poorly designed or badly placed turbines.

"Birds only fly into turbines that are installed along the flight routes of the birds. Research was therefore undertaken before the Escom turbines were erected," he said.

"We have not had any occurrence of bird deaths since the erection of the turbines in August. We do not say that it will not occur, but if it does, it will be minimal," he says.

Three endangered bird species – the blue crane, the white pelican and white storks – occur in the area where the Escom turbines have been erected. The turbines are not in the path of any of the existing flight routes of these birds. Large birds are in greater danger of flying into the turbines. Poor light conditions – like misty or rainy weather – can also play a role because this may render the blades invisible. The risk is increased when "towers" that provide room for birds to perch are erected near the blades. Raptors, especially, utilize such towers as perches from which to hunt and fly into the blades when they dive for prey.

In Spain, researchers have found that birds are only endangered when the turbines are erected in the wrong places and that only about 28 of the 190 turbines have been responsible for bird deaths. At the Alamont Pass in California, in America, only 13% of the turbines have been responsible for bird deaths.

According to Mr. Tony Stott, general environmental manager of Escom, thorough research has been undertaken and no problems have occurred.

Stott says that more occurrences are reported overseas because more turbines are erected than in South Africa.

The two turbines are on the Moedmaag hill, a West Coast hill 20 km from Yzerfontein and 12 km from Darling. A third turbine is to be erected soon.

The wind in this area blows at an average 22 km/h and researchers believe that this is one of the world's best locations for generating wind energy.

The rotors catch the wind and convert the movement into 1,6 MW electricity per turbine.

Underground cables transfer the power to Escom's main power grid 800 metres away.

From: Rapport, 5 January 2003, p. 14

1. Quote any sentence, besides the one in (2), below, to confirm the fears of bird lovers.

_____
_____
_____
_____

2. It was found that 28 of the 190 turbines in Spain cause bird deaths. Would you say that birds are therefore (highly endangered, minimally endangered, not endangered at all)?

_____
_____
_____
_____

Assignment 3

3. Discuss the wind power experiment with other people and note down their approval or disapproval regarding the matter. Quote from the newspaper report when you ask them for their input.

DARLING WIND POWER EXPERIMENT

Full name of respondent	In favour of wind power (Tick if applicable)	Not in favour of wind power (Tick if applicable)	Reason for attitude
Example: Johan Walters	√		It will reduce pollution.
1._____	_____	_____	_____

continued on next page

2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

Table 1.19

Now that you have heard other opinions, you must formulate a deduction from the data and present it to the rest of the class. Also defend the general inclination of the respondents. (This does not necessarily have to reflect your own view of the matter.)

GROUP ASSESSMENT CRITERIA	1	2	3	4
Reporting full and to the point	____	____	____	____
For making a deduction and defending it	____	____	____	____

Table 1.20

4 HYDRO-ELECTRIC POWER

WATER POWER

The Egyptians already used running water to operate machines for grinding wheat centuries ago, and electricity has been generated with the help of water since 1882. This form of electricity, which is known as hydro-electricity, provides almost one quarter of the world's electric power.

Hydro-electric power stations are built at dams or on fast flowing rivers. The important advantage of hydro-electricity lies in the fact that water is a renewable resource and does not cause pollution. A dry country like South Africa, however, has few places where hydro-electric power stations can be erected.

Wave power is another form of power that can be obtained from water and this holds much promise for the generation of power in the future. The movement of the waves along the coast are used to generate this kind of power.

From: Die Huisgenoot, 7 November 2002, p. 105

The following diagram shows a hydroelectric power station.

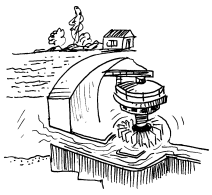


Figure 1.29

1.14.3.8 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2: We know this when the learner plans investigations and collects data;

Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings.

1.14.4 To be able to discuss sound energy as a form of energy[17]

1.14.4.1 NATURAL SCIENCES

1.14.4.2 Planet earth and the universe

1.14.4.3 Different forms of Energy

1.14.4.4

1.14.4.5 EDUCATOR SECTION

1.14.4.6 Memorandum

Ruler

Example (accept other logical explanations and descriptions):

Length of part of ruler that protrudes	Speed of vibration (frequency)	Sound(pitch)
5 cm	Very rapid	Loud, high sound
15 cm	Slower	Lower sound
25 cm	Slow	Soft, low sound

Table 1.21

Knock on table: sound is louder if ear is on table.
In water: sound is softer.
Comparison:
Table – high pitch
Swimming-pool/bath – lower pitch
Table

Instrument	How vibration is caused
box guitar	string vibrates
rattles	objects move back and forth, collide against each other and against sides of container
cymbals	metal beats against metal
trumpets	lips cause vibrations in air (amplified by "tube")
drums	vellum ("skin") vibrates when one beats against it
drummers	as for drums
any correct examples are acceptable	
scraper	vibration is caused when scraper moves over the groove

[17] This content is available online at <http://cnx.org/content/m20188/1.1/>.

Table 1.22

Assignment 3:
Noise pollution
Any five examples such as lorries / traffic, construction machines, aeroplanes, loud music, lawn mowers, (children who make a noise?), etc.

1.14.4.6.1

1.14.4.7 LEANER SECTION

1.14.4.8 Content

1.14.4.9 Activity: To be able to discuss sound energy as a form of energy [LO 1.2, LO 1.3]

- Sound is created when objects vibrate. Sound makes it possible for us to communicate with one another when we speak and hear. Some sounds cause problems, mainly when they are too loud. When this happens, we talk about noise pollution.

- THE ORIGINATION OF SOUND THROUGH VIBRATIONS

Try the following in your groups.

- Hold down one end of a plastic ruler on the edge of your desk as in the illustration.

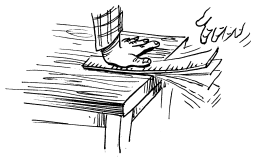


Figure 1.30

- Bend the end of the ruler downwards and let go.
- Watch the vibration. Listen to the sound.
- Force the ruler down further so that it will vibrate over a larger distance. You have now increased the ruler's amplitude (of vibration). How does it affect the sound?
- Adjust the length of ruler that protrudes over the edge of the desk. What do you notice with regard to the speed of the vibration (which is known as the frequency) when you adjust the length of the piece that vibrates? What do you notice concerning the sound that is created?
- Decide on a way in which to record your findings in the form of a table.

- HOW DO WE HEAR THE VIBRATIONS?

Arrange a number of dominoes in a row. Allow a space equal to three-quarters of the length of the domino between dominoes. Knock down the first domino.

Figure 1.31

Like the dominoes that start a chain reaction when one falls against another and all are knocked down, a vibrating ruler or elastic band, or any vibrating object, knocks against air particles. When the vibrating ruler moves, it forces air particles together.

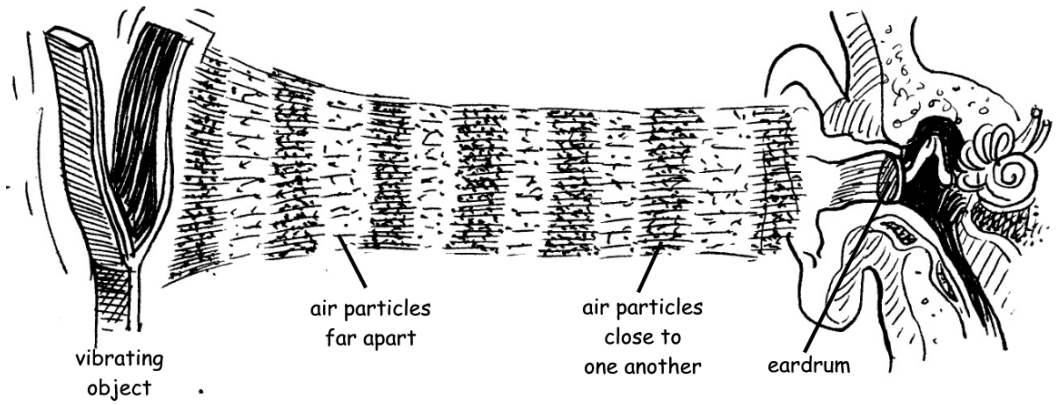


Figure 1.32

The air particles push those next to them in the same way as a domino knock over the one next to it. When air particles knock against each others, the movement is eventually extended far enough for the air particle next to your eardrum to knock against the eardrum (the tympanic membrane). The air particles cause the eardrum to vibrate in the same way as the ruler. This is how we are able to hear the vibrations of the ruler.

- CAN SOUND PASS THROUGH VARIOUS SUBSTANCES?

We see the sun shining every day, but we cannot hear the explosion of the gases that the sun consists of. It would sound like millions of exploding nuclear bombs. Why don't we hear it? The answer is simple: sound can only travel through matter - solid substances, liquids or gases.

The earth is surrounded by an atmosphere consisting of gases to a depth of approximately 100 km.

Beyond the atmosphere there is empty space and sound cannot travel through it. Space travellers need to use radios to communicate with one another when they are in space.

Use your finger to knock against the table. Listen to the sound. Now press your ear to the table, knock again and write down what you notice.

_____
_____
_____
_____

Figure 1.33

Put your head, or one ear, under the water when you next have a bath, or go swimming. Tap the side of the pool or the bath with your finger. Write down what you observe.

____
____
____
____

Figure 1.34

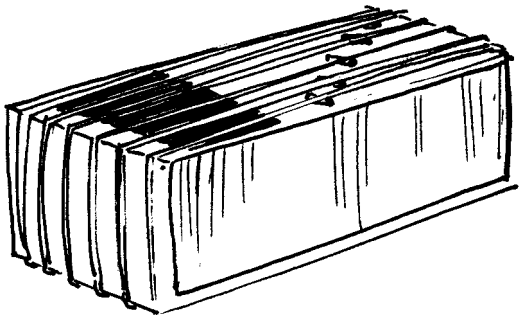
In which case did we hear a high tone and in which case was it a low tone?

- Connect the right combinations:

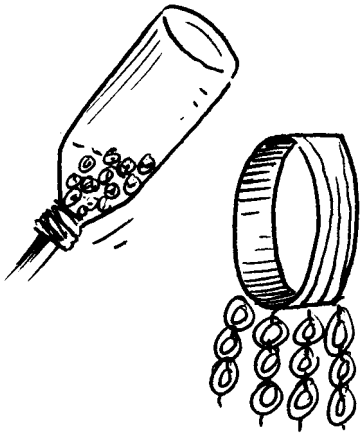
Knocking on the table - low tone
Tapping the side of the pool or bath - high tone

Figure 1.35

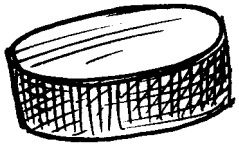
You could have a lot of fun making your own musical instruments and forming an orchestra. Look at the following illustrations, which are suggestions of how you can make instruments.



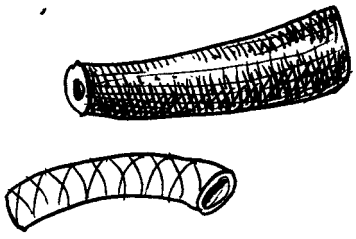
box-guitar



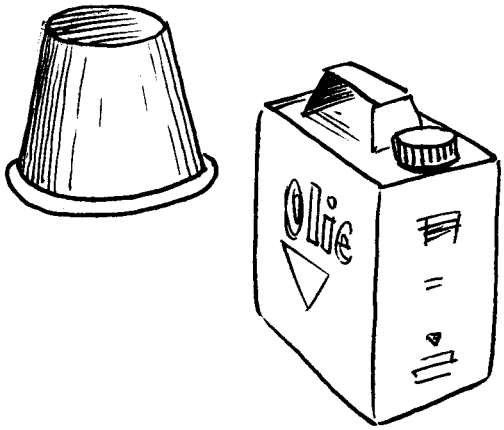
rattles



cymbals



trumpets



drums

Table 1.23

Assignment 3
Describe how vibrations resulting in sound are caused in the case of each of the following instruments.

Instrument	How vibration is caused
Box-guitar	_____
Rattles	_____
Cymbals	_____
Trumpets	_____
Drums	_____
Drum-sticks	_____
Scraper	_____

Table 1.24

(5)

- NOISE POLLUTION

We experience some sounds as problematic, usually when they are too loud. If this is the case, we refer to it as noise pollution.
List five examples of noise pollution.
1. _____
2. _____
3. _____
4. _____
5. _____

1.14.4.10 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.
Assessment Standard 1.2: We know this when the learner plans investigations and collects data;
Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings.

1.14.5 To be able to describe electrical energy as a form of energy[18]

1.14.5.1 NATURAL SCIENCES

1.14.5.2 Planet earth and the universe

1.14.5.3 Different forms of Energy

1.14.5.4

1.14.5.5 EDUCATOR SECTION

1.14.5.6 Memorandum

1. (a) Refrigerator

[18]This content is available online at <http://cnx.org/content/m20190/1.1/>.

(b) Vacuum cleaner
(c) Drill
(d) Hair drier
(e) Toaster
(f) Egg-beater
(g) Small lamp
(h) Radio/CD player/cassette player
2. Any correct examples are acceptable
(a) Milk and meat in sealed wooden barrel or metal container, in streamlet or river
(b) Broom
(c) Little hole with hand drill, or nail knocked in, or glowing iron bar
(d) Towel or sun
(e) Grilled over open fire
(f) Whisked with fork
(g) Candles or lamps
(h) Made own music (played instruments)

1.14.5.7 LEANER SECTION

1.14.5.8 Content

1.14.5.9 Activity: To be able to describe electrical energy as a form of energy [LO 3.1]

- This form of energy is most widely used in everyday life.

Study the sketches of the different appliances and answer the questions that follow:

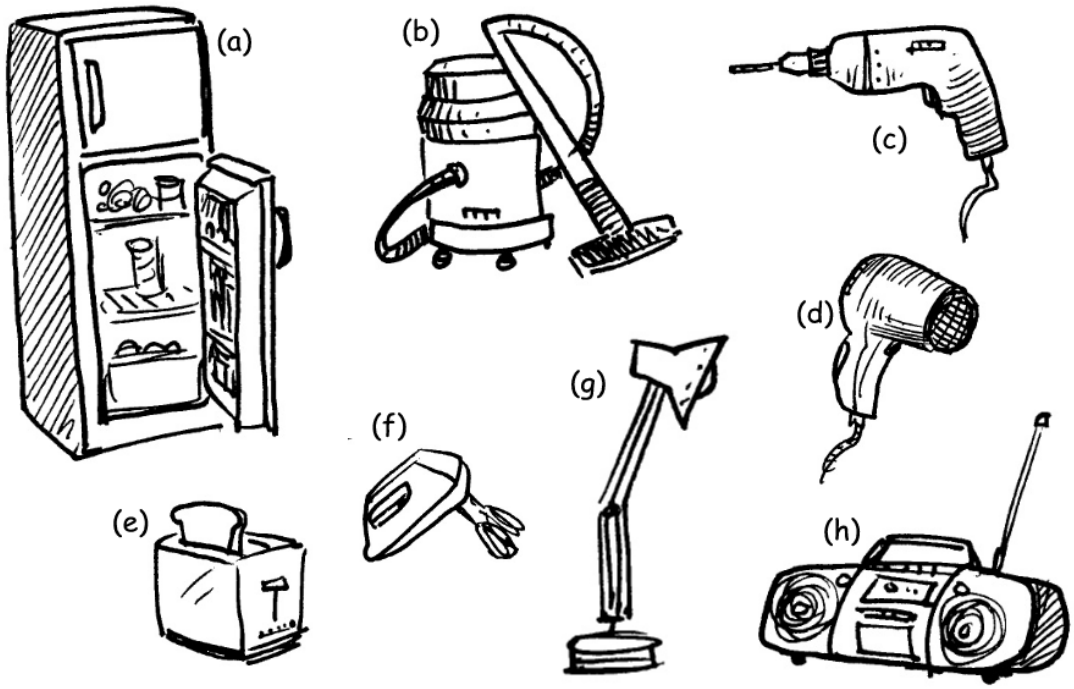


Figure 1.36

1. Identify and list the names of the different appliances.
(a)_____
(b)_____
(c)_____
(d)_____
(e)_____
(f)_____
(g)_____
(h)_____

2. Which techniques or methods were used in earlier days to do the tasks for which these appliances are used nowadays?
(a)_____
(b)_____
(c)_____
(d)_____
(e)_____
(f)_____
(g)_____
(h)_____

CRITERIA	YES	NO
All appliances identified correctly	_ _ _ _ _	_ _ _ _ _
Ideas about the past reveal creative thinking	_ _ _ _ _	_ _ _ _ _
Ideas are substantiated well	_ _ _ _ _	_ _ _ _ _

Table 1.25

1.14.5.10 Assessment

Learning Outcome 3:The learner will be able to demonstrate an understanding of the interrelationships between science and technology, society and the environment.

Assessment Standard 3.1: We know this when the learner understands Science and Technology in the historical context.

1.14.6 To be able to describe static electricity and lightning as sources of energy[19]

1.14.6.1 NATURAL SCIENCES

1.14.6.2 Planet earth and the universe

1.14.6.3 Sources of energy and energy systems

1.14.6.4

1.14.6.5 EDUCATOR SECTION

1.14.6.6 Memorandum

Static:

- Shop trolleys have little chains that trail on the ground. Charges flow into the ground.
- Happens when something is rubbed and there is resistance, e.g. hands on a handle, clothes on a seat, etc.

Lightning:

Any examples, e.g.

- Don't stand in front of open doors and windows.
- Wear shoes with rubber soles.
- Stay away from wire fences.
- Lie flat. Never stand upright or on an object.
- Install lightning conductors.

Don't use the telephone when there is lightning.

1.14.6.7

1.14.6.8 LEANER SECTION

1.14.6.9 Content

- The natural sources of energy that we have examined, namely sun, wind and water, only partially meet the need for energy. Little attention has been paid to the development of these sources because

[19]This content is available online at <http://cnx.org/content/m20193/1.1/>.

it is difficult to capture, store and control these sources. The following are the main resources used to supply the human need for energy.

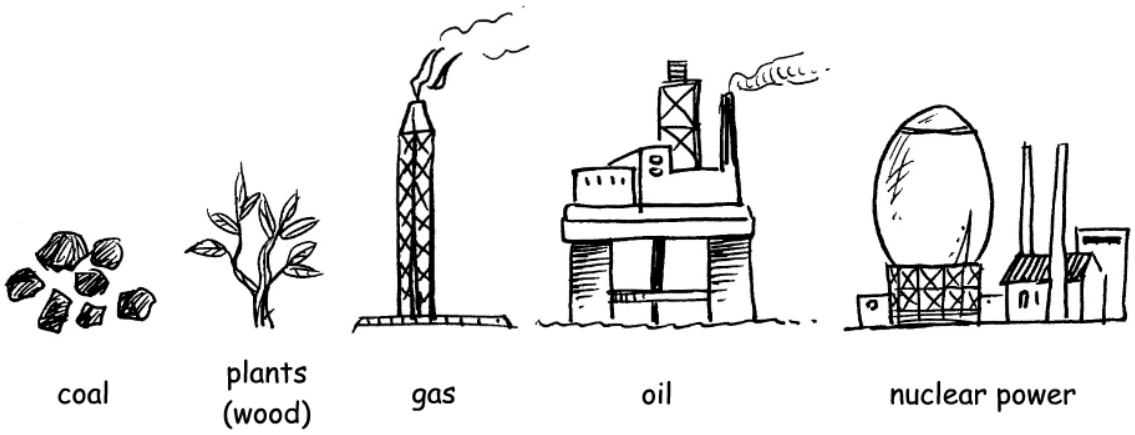


Figure 1.37

Nuclear power is the newest and most dangerous fuel that is available.
We will now examine the sources of electrical energy, the following in particular:
static electricity and lightning
cells
batteries
dynamos
coal-driven power stations
nuclear power
You have already become acquainted with some of these sources in Grade 5. This year we are going to deal with them in more detail. We are also going to help you to understand what energy systems are and how some of the sources can be described as systems.
Meanwhile, remember the following definition of a system:
A system consists of two or more parts that work together or influence one another.

1.14.6.10 ACTIVITY: To be able to describe static electricity and lightning as sources of energy [LO 2.3]

- STATIC ELECTRICITY

We have learnt that static electricity is present in the air around us at all times. Static electricity is not very powerful, but we can make it more powerful by means of friction.

Figure 1.38

Static electricity can also cause an unpleasant electrical shock. Metal shopping trolleys used in shops are made in a way that allows the electricity that builds up to be conducted away.

Figure 1.39

- Discuss this method of conduction in your group and draw a picture of shopping trolley.

- How does static electricity originate?

_____
_____
_____

- LIGHTNING

You have learnt that all materials are composed of small particles. Such particles are sometimes charged with electricity. They can be positively or negatively charged. Electricity is generated when negatively charged particles move from one place to another. Sometimes the flow of electricity is observed as a spark. Lightning is a great deal of electricity that is observed as a spark in the air. One could say that lightning results from large numbers of negatively charged particles moving from one cloud to another.

- Write down some safety measures that can be applied during a thunderstorm.

1._____
2. _____
3. _____
4. _____

1.14.6.11 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information

1.14.7 To be able to describe cells as a source of electrical energy[20]

1.14.7.1 NATURAL SCIENCES

1.14.7.2 Planet earth and the universe

1.14.7.3 Sources of energy and energy systems

1.14.7.4

1.14.7.5 EDUCATOR SECTION

1.14.7.6 Memorandum

Cell as a system:

Positive pole (protuberance), negative pole (plate), container with mixture in which charge develops and is stored.

Examples:

Torch, radio, alarm clock, remote control, pocket calculator, watch, etc.

Conductors/non-conductors:

Conductors – paper clip, nail, metal sharpener, key, hairpin, water.

Non-conductors – pencil, plastic ruler, shoelace, test tube, rubber, spectacle-frame (non-metallic)

Assignment 4:

Something to do:

The purpose of the game is to move the wire through the obstacle without touching the wire. If it touches, the light goes on. Decide how many times one may try.

Circuit as a system: The cell supplies the energy that moves through the wire, and makes the bulb light up.

The dimming of the light: The longer the wire through which the energy must flow, the dimmer the light.

[20]This content is available online at <http://cnx.org/content/m20196/1.1/>.

1.14.7.7 LEANER SECTION

1.14.7.8 Content

1.14.7.9 ACTIVITY: To be able to describe cells as a source of electrical energy [LO 1.2, LO 1.3, LO 2.3]

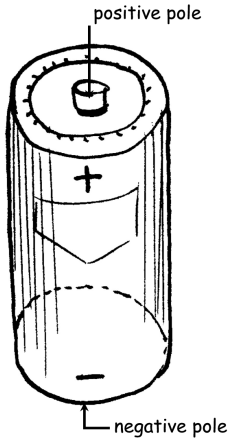


Figure 1.40

A simple torch (battery) cell

A small, centrally placed, metal knob can be found at the top of a cell. This is the positive (+) pole of the cell. The metal base of the cell forms the cell's negative (-) pole.

- Now describe the cell as a system:

_____
_____
_____
_____

- Cells like the one illustrated above are used to provide electricity. Name some situations in which such cells are used.

1. _____
2. _____
3. _____
4. _____
5. _____

A simple circuit like this can be built with a single cell.

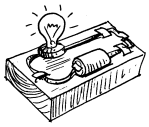


Figure 1.41

When you connect the light bulb, the cell and the conducting wire, you create an electrical circuit. Describe the circuit as a system:

_____
_____
_____
_____

It is important to find out more about conductors and non-conductors before we take a further look at circuits.

- CONDUCTORS AND NON-CONDUCTORS

Energy can be transferred by different means. When electricity is "transported" by a particular material, the material is known as a conductor. When a material does not have the capacity to "transport" or conduct electricity, we speak of it as a non-conductor. You can set up testing apparatus to determine whether a material is a conductor or a non-conductor.

Set up the following incomplete circuit and test the given materials to determine whether they are conductors or non-conductors:

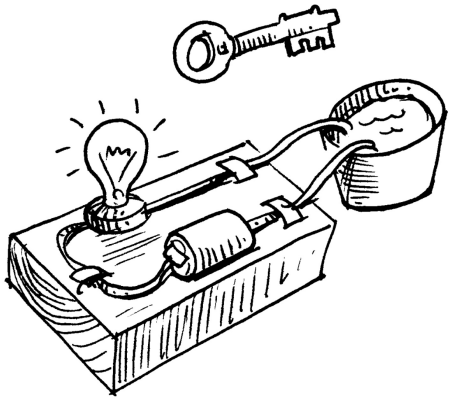


Figure 1.42

Pencil
Metal pencil sharpener
Water

Test tube
Paper clip
Shoelace
Eraser
Key
Nail
Plastic ruler
Spectacle frames
Hairpin

CONDUCTOR	NON-CONDUCTOR
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Table 1.26

Electrical conducting wire consists of an inner part that is a good conductor e.g. copper covered in a good non-conductor (insulator), e.g. plastic, rubber or cotton. The insulator prevents leakage of electricity.

- COMPLETE AND INCOMPLETE CIRCUITS

Your investigation has shown that a circuit has to be complete for the light bulb to light up. When you, for instance, used the eraser as part of the circuit, you had a charge on the circuit all the time, but it could not be conducted because the circuit was incomplete. A switch creates a similar gap in the circuit, and prevents the charge from flowing through the circuit.

You can create switches in various ways. Do try the following:

Requirements:

- wooden block
- 2 drawing pins
- small tin or copper plate
- conducting wire
- light bulb
- 1 or 2 cells

Assemble the items according to the sketch and you'll have your own switch!

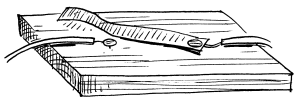


Figure 1.43

Assignment 4

- Work with a partner and design a game using a simple circuit and two switches.

Your game could comprise the following:

- a shoe box
- ·a 3,5 Volt light bulb
- ·two 1,5 Volt batteries
- insulation tape
- ·firm copper wire (one section of approximately 50 cm long and another of approximately 20 cm)
- ·a 50-cm length of ordinary flex, cut into different lengths
- Refer to the illustrations to see how to build your game.

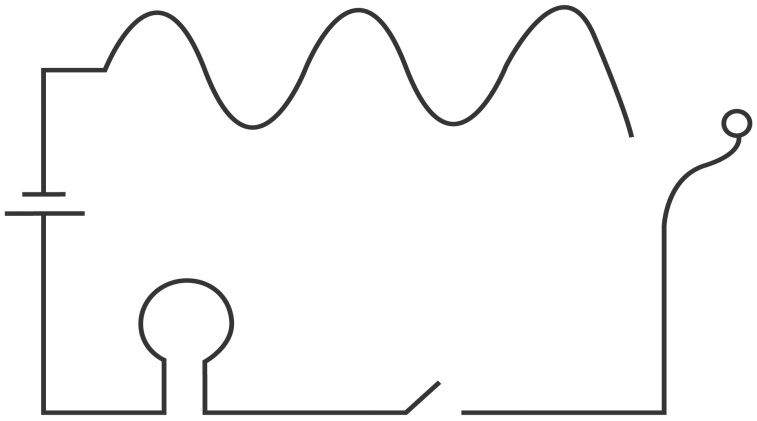


Figure 1.44

- When you have finished assembling the game, it should look like this:

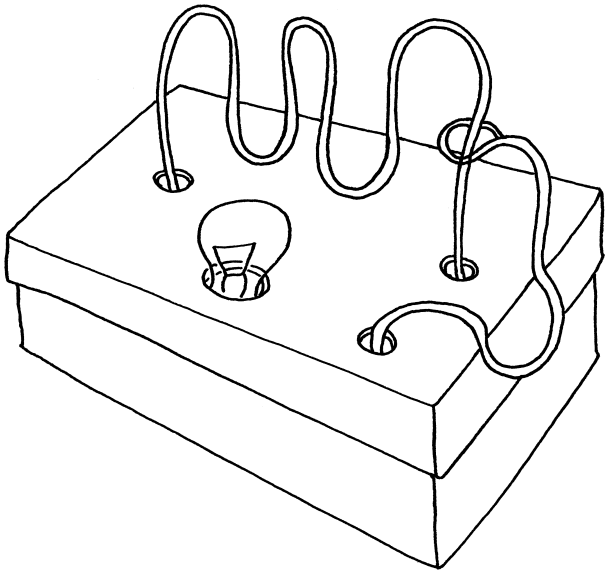


Figure 1.45

- Now do the following:

1. In one paragraph explain how this game works:

_____
_____
_____
_____

2. Describe the circuit as a system:

_____
_____
_____
_____

- AN APPARATUS FOR DIMMING A LIGHT BULB

Have you ever wondered how the light in the lounge is dimmed and made brighter? Building some resistance into the circuit does this. Copper is an excellent conductor, because electricity can flow through it with ease. When you use a thinner piece of copper wire as your conductor, there is less space for the electricity to flow. We speak of the resistance in thin copper wire as being higher than the resistance in thicker copper wire. You can create resistance by winding the wire (which has to be a conductor) around a pencil.

Create such a resistance and fit it into the circuit as follows:

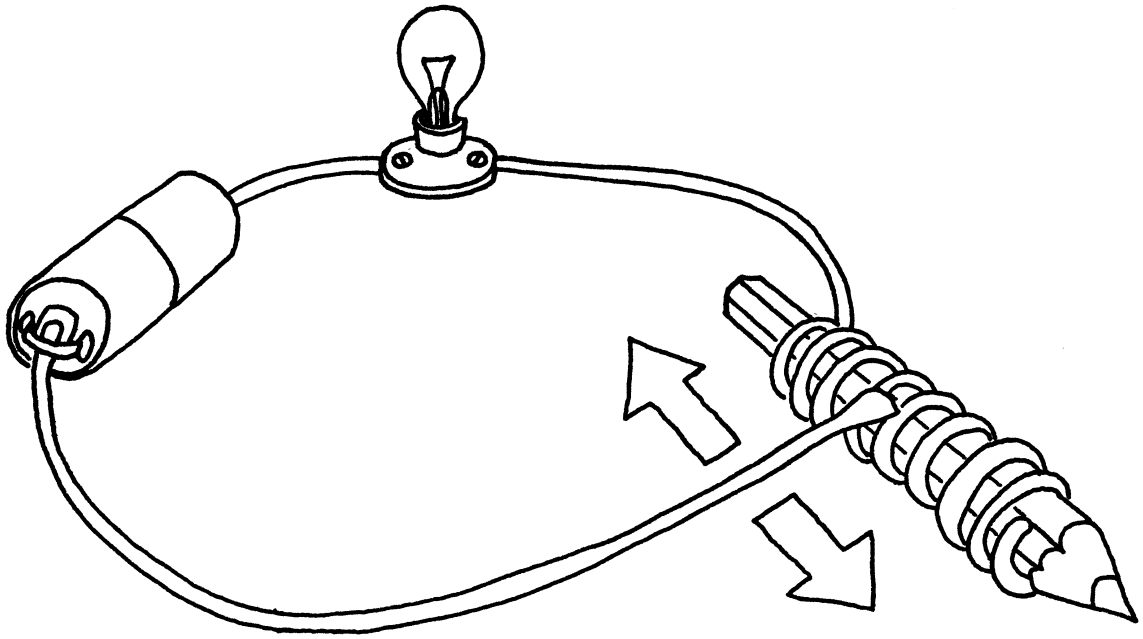


Figure 1.46

Move one conductor in the direction of the arrows. How does this affect the light bulb?

_____
_____
_____
_____
_____

1.14.7.10 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2: We know this when the learner plans investigations and collects data;

Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.14.8 To be able to describe the battery as a source of electrical energy[21]

1.14.8.1 NATURAL SCIENCES

1.14.8.2 Planet earth and the universe

1.14.8.3 Sources of energy and energy systems

1.14.8.4

1.14.8.5 EDUCATOR SECTION

1.14.8.6 Memorandum

Battery: six cells

Assignment 5:

Releasing energy:

If the poles /contact points of the battery are connected, a current flows and the energy is released.

12 Volt:

That indicates the amount of energy that is stored in the battery / the amount of work that can be done.

System:

The cells are connected to each other and supply energy together on account of the fact that they lie in a solution. They are connected to two poles that can be connected in a circuit.

1.14.8.7 LEANER SECTION

1.14.8.8 Content

1.14.8.9 ACTIVITY: To be able to describe the battery as a source of electrical energy [LO 1.3]

- When we make use of two or more cells in a row, we speak of a battery. A car battery is one such example. We can normally recognise the cells because each one has an opening closed with a screw cap that has to be removed when we pour in distilled water. Besides the water, a battery also contains sulphuric acid, which is a strong corrosive acid. A battery is an excellent source of electricity.

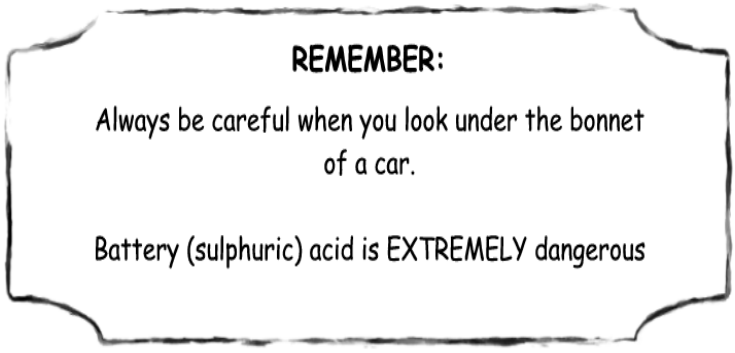


Figure 1.47

[21] This content is available online at <http://cnx.org/content/m20198/1.1/>.

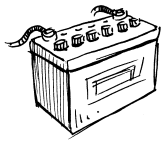


Figure 1.48

A car battery

How many cells does this battery have?_____

Assignment 5

- MAKE YOUR OWN BATTERY

Collect a number of nickel and bronze coins – six of each, preferably. Stack them on top of one another, separating the bronze and nickel coins with a piece of blotting paper previously soaked in salt water. You can use this battery to light up a light bulb!

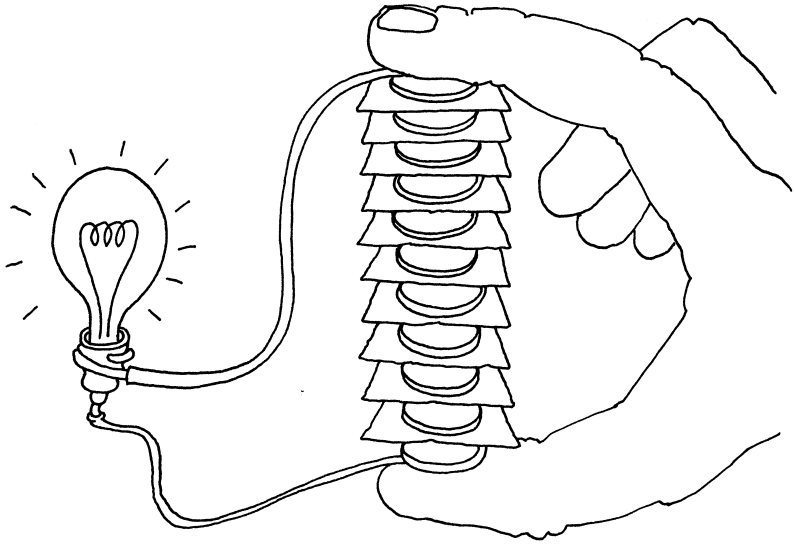


Figure 1.49

1. How is the energy stored in a battery set free?

_____
_____

2. Describe the battery as a system:

_____
_____

3. Try to establish what 12 Volt means:

_____
_____

1.14.8.10 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings.

1.14.9 To be able to describe the functioning of a dynamo as a source of electrical energy[22]

1.14.9.1 NATURAL SCIENCES

1.14.9.2 Planet earth and the universe

1.14.9.3 Sources of energy and energy systems

1.14.9.4

1.14.9.5 EDUCATOR SECTION

1.14.9.6 Memorandum

Example: The dynamo must touch the wheel so that it can turn, otherwise the bulb will not burn. If it touches, electricity is generated. The faster it turns, the more electricity is generated.

System: The cyclist must pedal in order to supply energy; there must be a mechanism to carry the energy to the dynamo; the dynamo is made up of a magnet and wires that convert the energy into electrical energy; the bulb releases the energy in the form of light.

1.14.9.7 LEANER SECTION

1.14.9.8 Content

1.14.9.9 ACTIVITY: To be able to describe the functioning of a dynamo as a source of electrical energy [LO 1.3, LO 2.3]

- Ask a friend who has a bicycle with a dynamo to bring the bicycle to the class. If this is not possible, you might ask the owner of a bicycle shop to lend you one.

The energy that is generated by a dynamo is, of course, used to light the light bulb.

A dynamo contains some wires and a magnet. When the bicycle wheel rotates, the magnet generates electrical energy in the wires. The energy flows along the circuit and the light bulb glows.

Investigate how a dynamo works:

[22]This content is available online at <http://cnx.org/content/m20199/1.1/>.

Figure 1.50

Use a bicycle with a dynamo:
1. Pull the dynamo away from the wheel and rotate the wheel.
2. Bring the dynamo in contact with the wheel and rotate the wheel.
3. Rotate the wheel slowly.
4. Rotate the wheel fast.
5. Keep your eyes on the light bulb continually.

Formulate the findings that you derive from the practical investigation in well-constructed sentences.
FUNCTIONING OF A DYNAMO (My group's effort)

1.14.9.10 Assessment

Learning Outcome 1:learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

1.14.10 To be able to demonstrate the functioning of coal-driven power stations as systems[23]

1.14.10.1 NATURAL SCIENCES

1.14.10.2 Planet earth and the universe

1.14.10.3 Sources of energy and energy systems

1.14.10.4

1.14.10.5 EDUCATOR SECTION

1.14.10.6 Memorandum

Diagram:

1. Coal is milled finely in coal mills so that it burns more easily.
2. Coal powder is taken to the smelting-furnaces where it is ignited.
3. Water is boiled in the boiler in order to produce steam.
4. Steam can make the turbines rotate.
5. The movement of the turbines causes the generator to generate electricity.
6. Power pylons transport the electricity to houses, factories, schools, etc.

Air pollution:

2 and 5 (the latter if the wires have not been properly insulated).

Assignment 6:

[23]This content is available online at <http://cnx.org/content/m20201/1.1/>.

Acid rain:
The carbon dioxide from the burning coal combines with water and forms acid that rains down.
Greenhouse:
The gases that are emitted during burning things form a layer. This causes heat to build up and the atmosphere becomes warmer.
Water level:
The ice melts at the poles as a result of the greenhouse effect; the amount of water increases as a result of the higher temperature (it expands); the water level rises and lower-lying areas are covered by water.

1.14.10.7 LEANER SECTION

1.14.10.8 Content

1.14.10.9 ACTIVITY: To be able to demonstrate the functioning of coal-driven power stations as systems [LO 1.3, LO 2.1, LO 2.3]

- The following two simple sketches show how electricity is generated in coal-driven power stations:

Sketch 1

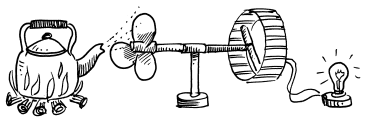


Figure 1.51

Sketch 2

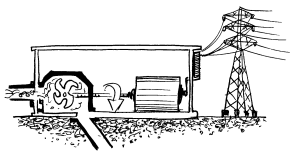
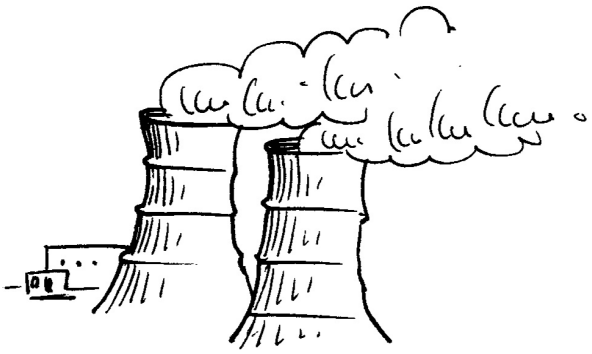


Figure 1.52

1. Coal is used as fuel. This is the origin of the serious pollution that causes the problems associated with this kind of electricity supply.
2. The heat from the fire boils the water in the steam-generating kettle.
3. The steam operates the fan.
4. Copper wire rotating inside the magnet generates electricity. You might realise that a dynamo is involved here.
5. The electrical current that is generated flows through the wire and causes the light bulb to glow.

Something interesting:

The one group looks like this. Sometimes we see white "clouds" above the towers. These towers are called cooling towers, because water is cooled down in them to be re-used.



The other group consists of high towers/chimneys characterised by dark "smoke columns" bubbling from them. This smoke comes from the coal that is being burnt.

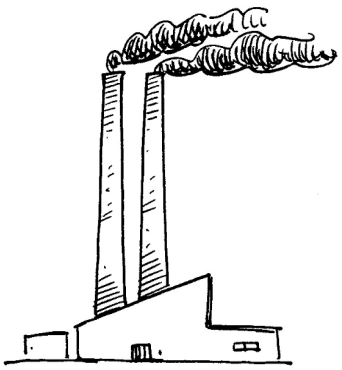


Figure 1.53

- The following sketch shows the process by which electricity is generated from coal.

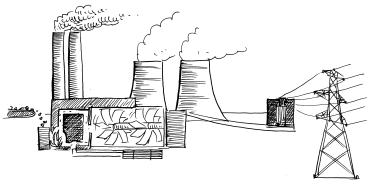


Figure 1.54

In this case, water is a renewable resource because the steam is cooled and condensed to water. The water is cooled further in the cooling towers and is then returned to the steam kettles for the process to be repeated.

Study the following information and arrange the steps in the correct order. Then complete the flow diagram.

- The turbines are turned by means of steam.
- Coal mills grind the coal so that it will burn more easily.
- Power lines transport the electricity to homes, factories, schools, etc.
- Water is boiled in steam kettles to produce steam.
- The movement of the turbines causes the generator to generate electricity.
- Coal powder is taken to the incinerators where it is ignited.

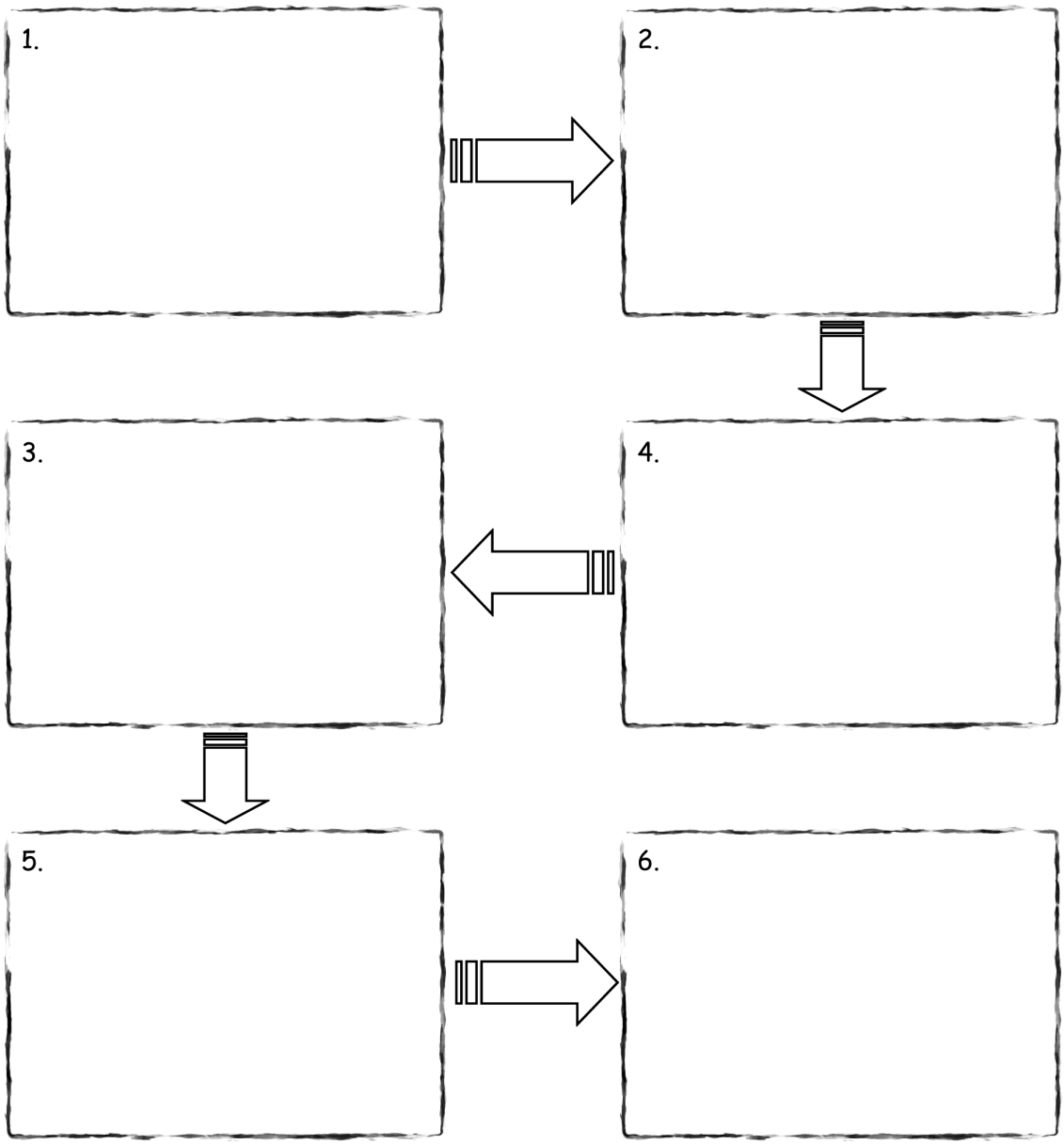


Figure 1.55

Use a red asterisk (*) to mark the stages of the process that present the highest air pollution risk (e.g. No. 3 and No. 5).

CRITERIA FOR PEER ASSESSMENT	1	2	3	4
1. Correct order	____	____	____	____
1. Pollution danger indicated	____	____	____	____

Table 1.27

Assignment 6
Acid rain:_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
Global warming / the greenhouse effect:
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Refer to the greenhouse effect and to what you have learnt about materials that expand when energy is added to them. Explain why parts of Cape Town may someday be flooded.

1.14.10.10 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1: We know this when the learner recalls significant information;

Assessment Standard 2.3: We know this when the learner interprets information.

1.14.11 To be able to discuss nuclear power as a method of generating electricity[24]

1.14.11.1 NATURAL SCIENCES

1.14.11.2 Energy transfers and systems

1.14.11.3 Sources of energy and energy systems

1.14.11.4 EDUCATOR SECTION

1.14.11.5 Memorandum

Assignment 7:

(a) – (b) Hiroshima and Chernobyl: Accept the learners' reports. See to it that the correct statistics are ultimately collected in class, for example 250 people died at Chernobyl, between 5 000 and 40 000 will ultimately die as a result of cancer which was caused by irradiation.

1. Learners' own opinion. Money can't buy everything; especially not good health.
2. No. An accident can cause irradiation. Many people may die. Refer to Hiroshima and Chernobyl.
3. Any place where there is nuclear material, for example at a nuclear power station or even on the fencing of a site. This means that one must be cautious; there is nuclear material in the area.

1.14.11.6 LEANER SECTION

1.14.11.7 Content

1.14.11.7.1 Activity: To be able to discuss nuclear power as a method of generating electricity [LO 2.3, LO 3.2]

- The only nuclear power station in Africa is situated near Cape Town. The Koeberg nuclear power station, supplies 1 840 megawatt, which is about 6,5 % of the total amount of South Africa's electricity needs. Koeberg has produced more than 81 000 million kWh of electricity since 1984, using seven and a half tonnes of uranium.

Building this type of power station is extremely costly and generation of nuclear power is a very dangerous process. Uranium 235 is used as fuel at Koeberg. People who work at Koeberg have to wear protective clothing to protect them from the possibility of radiation, as uranium is a radioactive element. It is a greyish metallic substance. The reactors in which nuclear power is generated are surrounded with thick concrete walls as a further measure to protect people against the dangers of radiation, which might lead to cancer.

Waste products that result from the process are very toxic and can remain radioactive for thousands of years. Some of the less dangerous radioactive materials are buried in sealed containers deep below the earth, but no acceptable manner of disposal has yet been developed to take care of high-level radioactive material.

"Greenpeace" is an organisation that is strongly opposed to the use of nuclear power to generate electricity.

There are clear advantages to the use of nuclear power, as an incredible amount of energy can be obtained from a very small quantity of fuel (uranium).

[24] This content is available online at <http://cnx.org/content/m20637/1.1/>.

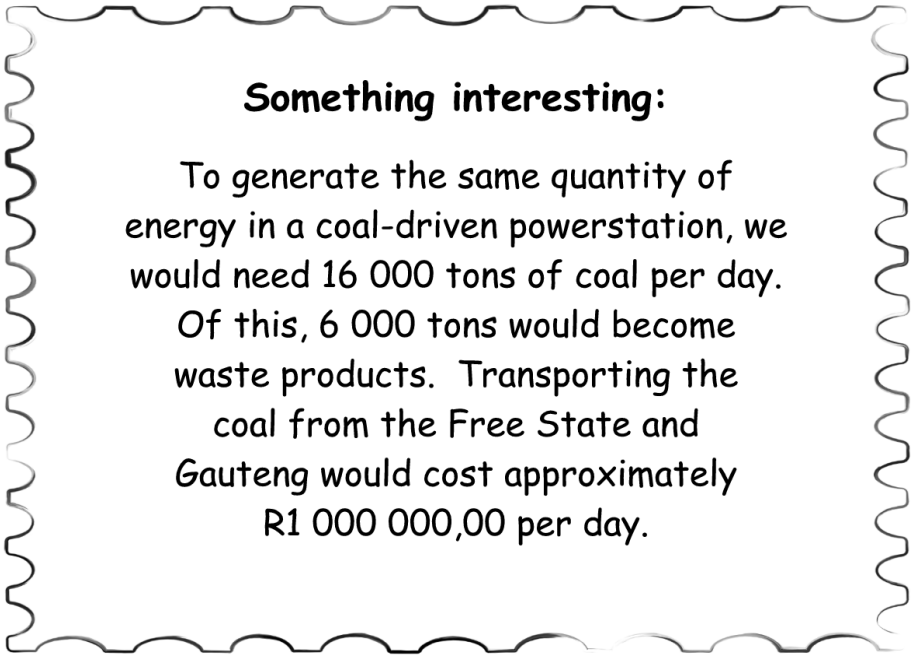


Figure 1.56

FIND OUT MORE ABOUT:

(a) The nuclear bombs that were dropped on the Japanese cities of Hiroshima and Nagasaki in 1945 during the Second World War.

(b) The accident that occurred at the Chernobyl power station in the USSR on 25 April 1986.

ANSWER:

1. Would you be willing to work in a nuclear power station and earn plenty of money but run the risk of radiation? Explain.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

2. Should power stations be erected close to residential areas? Motivate your answer.

_____
_____
_____
_____
_____
_____

3. What is the meaning of this emblem? Where would it be used?

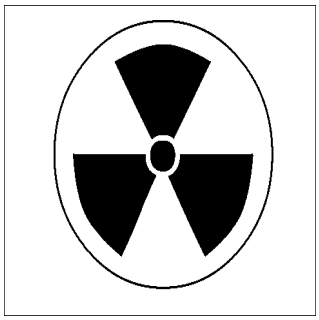


Figure 1.57

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

1.14.11.8 Assessment

Learning Outcome 2: The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information.

Learning Outcome 3: The learner will be able to demonstrate an understanding of the interrelationships between science and technology, society and the environment.

Assessment Standard 3.2: We know this when the learner understands the effect of Science and Technology.

1.14.12 To be able to describe the uses of electrical energy[25]

1.14.12.1 NATURAL SCIENCES

1.14.12.2 Energy transfers and systems

1.14.12.3 The uses of electricity

1.14.12.4 EDUCATOR SECTION

1.14.12.5 Memorandum

Table: Example (accept other suggestions from learners)

[25] This content is available online at <http://cnx.org/content/m20639/1.1/>.

Function	Appliances	Functioning as a system
Warmth	Heater	Element (metal) becomes hot because of resistance to the current that flows; energy is released in the form of heat. Can heat oil or water.
	Oven	As above, but in a container in order to prevent heat loss.
	Stove plate	Element that forms a flat surface on which saucepans/pots/pans can stand and come into contact with heat. Flat surface limits heat loss.
	Toaster, kettle, iron, etc.	
Light	Warm light bulb	Contains element that glows in container with gas that prevents it from fusing.
	Fluorescent light with two poles where electricity moves through gas	Does not become very hot, thus little heat loss.
	Camera flash	
Motion	Vacuum cleaner	Electricity makes motor, which is made up of wires and magnets, move. This creates suction-power.
	Lawn mower, drill, eggbeater, fan, are other examples .	
Sound	Radio	Electricity is used to pick up radio waves and to convert them to sound waves that are then transmitted through the speaker.
	Alarm systems, alarm clocks, TV – similar.	

continued on next page

Table 1.28

1.14.12.6 LEANER SECTION

1.14.12.7 Content

1.14.12.7.1 Activity: To be able to describe the uses of electrical energy [LO 2.1]

- Escom is the largest supplier of electricity in South Africa. Their target is to provide electricity to hundreds of "new" schools, hospitals and homes annually.
- The most general uses, for which electricity is applied, are for the provision of warmth, light, motion and sound.
- Think of electrical appliances that provide heat, light, movement and sound. Choose two for each of the uses. Research the way in which electrical energy is used to make the appliance perform the function for which it is utilised (in other words, how each one functions as a system).
- Complete the table below by filling in the information that you have collected. Make sure that you select a variety of appliances in each group.

FUNCTION	APPLIANCES	FUNCTIONING AS A SYSTEM
WARMTH	1.	_____
	2.	_____
LIGHT	1.	_____
	2.	_____

Table 1.29

GROUP ASSESSMENT CRITERIA	1	2	3	4
Correct categorisation	_____	_____	_____	_____
Good selection of appliances	_____	_____	_____	_____

Table 1.30

1.14.12.8 Assessment

Learning Outcome 2: The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1: We know this when the learner recalls significant information.

1.14.13 To be able to describe and applythe international colour code for electrical wiring and name safety measures for the use of electricity[26]

1.14.13.1 NATURAL SCIENCES

1.14.13.2 Energy transfers and systems

1.14.13.3 The uses of electricity

1.14.13.4 EDUCATOR SECTION

1.14.13.5 Memorandum

Colours: Green/yellow top, brown left, blue right (the latter two can interchange).

Earth wire: Conducts current so that overheating does not take place/makes earth leakage switch trip to cut off current. This prevents a fire from starting or someone from being electrocuted.

Sign: Danger. Electricity installations are dangerous. Not only shocks, but irradiation/magnetic fields are harmful to people.

1.14.13.6 Leaner Section

1.14.13.7 Content

1.14.13.7.1 Activity: To be able to describe and applythe international colour code for electrical wiring and name safety measures for the use of electricity [LO 1.2, LO 1.3, LO 2.3]

FOR THE USE OF ELECTRICITY

- The three-veined electrical cord consists of three conductors, each with its own characteristic colour. Each conductor has a separate function. The colours that are used are applicable in all countries and are known as the international colour code.

[26] This content is available online at <http://cnx.org/content/m20641/1.1/>.

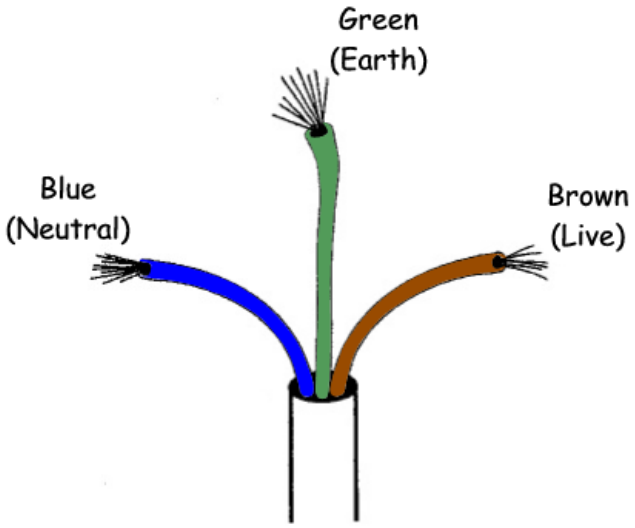


Figure 1.58

Power plugs have to be wired according to the international colour code.

- The blue wire is the neutral conductor and it conducts electricity from the appliance to the power source.
- The brown wire is the live conductor and conducts electricity from the power source to the appliance.
- The yellow-and-green wire is the earth wire and it conducts excess electricity away when there is a short circuit.
- Your educator will show you what a correctly wired power plug looks like. Be sure to know exactly where each of the conductors has to be screwed down or the appliance will endanger the life of anyone who touches it.

Use the appropriate colour to indicate how you would wire the power plug in the following sketch:

Figure 1.59

- Do some research to find out why it is important to have an earth wire? Also refer to the earth leakage switch on the switchboard in your home.

- Have you ever seen this sign?

Figure 1.60

What does it mean? _____
Why is it exhibited at electricity plants?

- Electricity is dangerous. Remember the following safety measures when you work with electricity:

- Never try to repair a broken electrical appliance yourself. Rather ask a trained electrician to do the job.
- Water is a good conductor of electricity. Never work with electricity when you are near water.
- Do not pull a power plug from the socket by the cord.
- Ensure that you know where the building's main switch is so that you will be able to switch off the main stream immediately if something should go wrong.
- Do not install electrical cords underneath carpets. It is too difficult to check the condition of the cord if it is not visible at all times.
- It is good policy to get a qualified electrician to check electrical appliances from time to time.

1.14.13.8 Assessment

Learning Outcome 1: The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2: We know this when the learner plans investigations and collects data;

Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings.

Learning Outcome 2: The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information

1.14.14 To be able to describe what energy loss means[27]

1.14.14.1

1.14.14.2 NATUURWETENSKAPPE

1.14.14.3 Energie-oordrag en Stelsel

1.14.14.4 Besparing van energie

1.14.14.5 OPVOEDERS AFDELING

1.14.14.6 Memorandum

1.14.14.6.1

1. Hitte/warmte.
2. Baie na min.
3. Hitte vanweë wrywing: al die energie word dus nie vir die dryf van die wiele gebruik nie
4. Hitte: of vanweë wrywing by die band op teer en dus die persoon wat trap. Weer eens word al die energie nie doeltreffend aangewend nie.
5. Warmwatersilinder, warm bad, swembad, huis na buite, ens.
6. Enjin wat olie brand (al die brandstof ontbrand nie), slinger wat gebuig is en nie maklik draai nie, swak kontakpunte in elektriese apparaat soos motors, stomp gereedskap (boorpunte, saaglemme, ens.).
7. Ligte wat onnodig brand, warmwatersilinder wat nie afgeskakel word nie, onnodige gebruik van apparaat, bv. verwarmers as die huis nie goed gensuleer is nie, warm water in bad en dan wag dat dit afkoel as dit te warm is, elke keer warm water oopdraai as iets in die kombuis afgespoel word, ens.

1.14.14.7 LEERDER AFDELING

1.14.14.8 Inhoud

1.14.14.9 AKTIWITEIT: Om te kan beskryf wat energieverlies beteken [LU 2.3, LU 3.2]

- Bestudeer die volgende sketse en beantwoord die vrae wat daarop volg:

[27] This content is available online at <http://cnx.org/content/m20792/1.1/>.

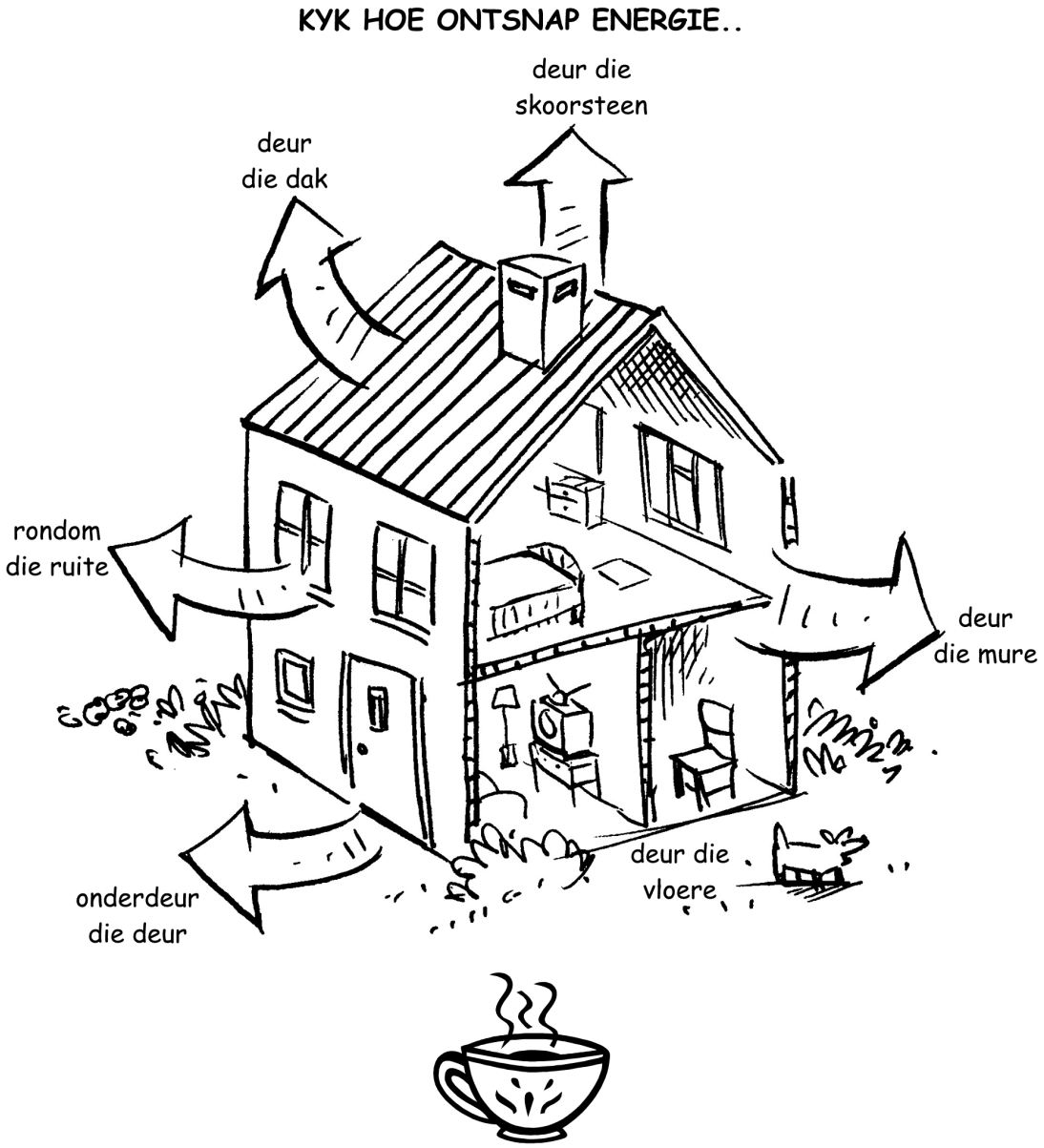


Figure 1.61

1. In watter vorm gaan die energie uit die huis en uit die koppie tee verlore?

_____

_____

2. Die energie beweeg dus van waar daar s _____ is na waar daar _____ is (vul in min of baie)

3. Dink aan 'n ander voorbeeld: 'n persoon bestuur 'n kar waarvan een van die remme vasgeslaan het. Energie gaan verlore. In watter vorm? Beskryf:

_____

4. Nog 'n voorbeeld: jy ry op jou fiets, maar een van die bande is pap. Energie gaan verlore. In watter vorm? Beskryf:

In albei hierdie gevalle (3 en 4) gaan energie verlore omdat die stelsel nie reg funksioneer nie.

Onnodige energieverlies kan ook plaasvind as stelsels wat goed funksioneer, nie korrek gebruik word nie, byvoorbeeld as jy 'n yskasdeur dikwels oopmaak of die deur vir lang tye laat oop staan, of wanneer jy 'n bietjie melk in 'n klein kastrol op 'n groot stoofplaat opwarm.

5. Noem nou nog vier voorbeelde waar energie verlore gaan omdat dit versprei van waar daar baie is na waar daar min is.

6. Noem ook vier voorbeelde van energieverlies vanweë 'n sisteem wat nie reg funksioneer nie:

7. Noem ook vier voorbeelde waar energieverlies plaasvind omdat toerusting foutiewelik gebruik word:

1.14.14.10 Assessering

Leeruitkomste 2:Die leerder ken, interpreteer en pas wetenskaplike, tegnologiese en omgewingskennis toe.

Assesseringstandaard 2.3: Dit is duidelik wanneer die leerder inligting interpreteer.

Leeruitkomste 3:Die leerder is in staat om begrip van die onderlinge verband tussen wetenskap en tegnologie, die samelewing en die omgewing te toon.

Assesseringstandaard 3.2: Dit is duidelik wanneer die leerder die impak van wetenskap en tegnologie verstaan.

1.14.15 To be able to describe how energy loss can be limited[28]

1.14.15.1

1.14.15.2 NATUURWETENSKAPPE

1.14.15.3 Energie-oordrag en Stelsel

1.14.15.4 Besparing van energie

1.14.15.5 OPVOEDERS AFDELING

1.14.15.6 Memorandum

Uit huis: Enige voorstelle. Meestes kom op insulasiemeganismes neer.
Rem: kry rem los. Papwiel: pomp die band.
Idees:
Daar is baie. Gee leerders voldoende geleentheid en laat gesprek toe.

1.14.15.7 LEERDER AFDELING

1.14.15.8 Inhoud

1.14.15.9 AKTIWITEIT: Om te kan beskryf hoe energieverlies beperk kan word [LU 3.2]

Kyk weer na die illustrasie van die huis by Aktiwiteit 4.1. Gesels in 'n groepie en dink aan maniere waarop julle die energieverlies uit die huis sou kan verminder:

1. _____
2. _____
3. _____
4. _____
5. _____

X Gevolgtrekking 1: energieverlies kan verminder word deur goeie **isolasie**.

Dink aan die voorbeelde met die remme en die papwiel in Aktiwiteit 4.1. Hoe kan die verlies van energie in die twee gevalle verminder word?

_____
_____
_____

- Gevolgtrekking 2: energieverlies kan verminder word deur toe te sien dat sisteme goed funksioneer.

- Gevolgtrekking 3: ons het ook gesien dat energie bespaar kan word deur die korrekte gebruik van elektriese toestelle.

Hier is 'n paar maniere om elektrisiteit in die huis te bespaar.

- Skakel die warmwatersilinder af as julle langer as 'n week van die huis gaan weg wees.
- Kook water in 'n ketel en gooi dit dan in 'n warmfles om later te gebruik.
- Dit is onnodig om elke keer 'n vol ketel water te kook as jy net een of twee koppies vol nodig het.
- Gebruik lae-energie gloeilampe.
- Installeer sonpanele op die huis se dak.

[28] This content is available online at <http://cnx.org/content/m20795/1.1/>.

MEER IDEES:

OPVOEDERASSESSERING: KRITERIA	1	2	3	4
1. Lewensvatbaarheid van idees	____	____	____	____
1. Finansiële implikasie (besparing of nie)	____	____	____	____

Table 1.31

1.14.15.10 Assessering

Leeruitkomste 3:Die leerder is in staat om begrip van die onderlinge verband tussen wetenskap en tegnologie, die samelewing en die omgewing te toon.

Assesseringstandaard 3.2: Dit is duidelik wanneer die leerder die impak van wetenskap en tegnologie verstaan.

Chapter 2

Term 3

2.1 To discuss the use of stars and planets with regard to the development of calendars[1]

2.1.1 NATURAL SCIENCES

2.1.2 The earth and beyond

2.1.3 The Stars

2.1.4

2.1.5 EDUCATOR SECTION

2.1.6 Memorandum

1. Star: Heavenly body that emits light. Consists mainly of burning helium and hydrogen.
   Planet: Lifeless heavenly body that gets light from the sun.
   2. Look at page 2 in the module.

2.1.7 LEANER SECTION

2.1.8 Content

EARLY MAN TRIED TO EXPLAIN THE MOVEMENT OF THE STARS AND PLANETS BY MEANS OF MYTHS AND LEGENDS. THE ANCIENT GREEKS TOOK A MORE SCIENTIFIC VIEW, BUT EVEN THEY BELIEVED MISTAKENLY THAT THE EARTH WAS AT THE CENTRE OF THE UNIVERSE.

FOR A FEW HUNDRED YEARS ONLY HAVE WE KNOWN THAT THE EARTH IS A VERY SMALL AND INSIGNIFICANT DOT? OUR SMALL PLANET ORBITS THE SUN, WHICH IN TURN IS MERELY ONE OF APPROXIMATELY 100 000 MILLION STARS IN OUR GALAXY AND WE NOW KNOW THAT THERE ARE AT LEAST 1 000 MILLION OTHER GALAXIES AS WELL.

[1] This content is available online at <http://cnx.org/content/m20213/1.1/>.

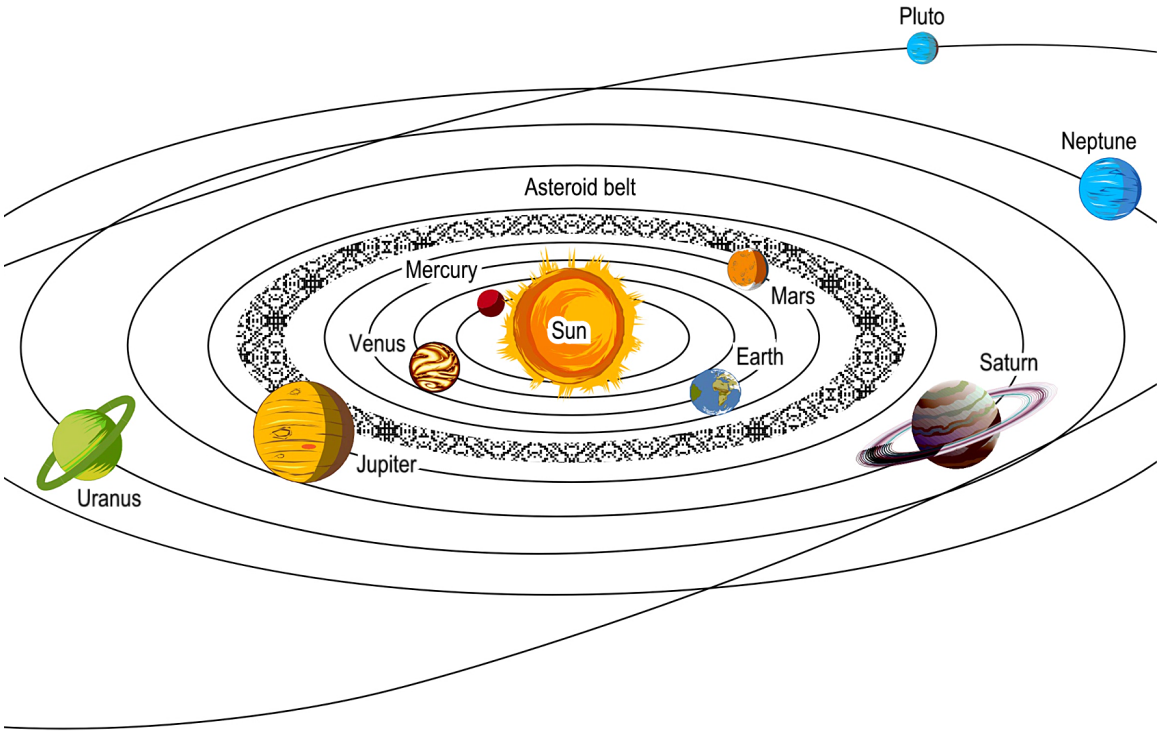


Figure 2.1

2.1.8.1 ACTIVITY: To discuss the use of stars and planets with regard to the development of calendars [LO 2.1]

THE CHRISTIAN CALENDAR

- This calendar uses the sun as the main means of keeping time. One year therefore measures $365\frac{1}{4}$ days - the exact duration of one of the earth's orbits of the sun. The beginning of the Christian calendar is the birth of Jesus Christ. The years preceding this event are referred to as before Christ or BC, and the years following it are spoken of as anno Domini (the year of the Lord) or AD.
- This calendar is the most commonly used calendar throughout the world (also by non-Christians).

THE MUSLIM CALENDAR

- People in the Muslim community use the moon to keep time. (The moon, being still and lifeless, has no light of its own but merely reflects the light of the sun. The moon therefore is not a star.)

THE JEWISH CALENDAR

- Jews use a calendar that refers to the moon for counting the months and the sun for determining the length of the years. This calendar is dated from the time of the Biblical creation of the world.

- Although the Jewish and Christian calendars use the sun to determine the length of a year, the dates of the Christian and Jewish New Year do not coincide.

THE CHINESE CALENDAR

- The sun and the planet Jupiter are used by the Chinese to calculate time. Jupiter takes about 12 years to complete an orbit of the sun. The Chinese calendar is therefore based on a cycle of twelve years. Each year is named after an animal.
- Each of the animals have particular characteristics, which, according to Chinese belief, are transferred to the people who are born in the particular year.

FIND OUT

1. Consult a dictionary or any other dependable source to find out what the difference between a planet and a star is.

Star:	_____
	_____
	_____
Planet:	_____
	_____
	_____

Table 2.1

2. Explain how the calendars of Christian, Jewish, Muslim and Chinese people differ.

_____
_____
_____
_____
_____
_____
_____

2.1.9 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1:**We know this when the learner**recalls meaningful information.

2.2 To indicate the routes taken by early discoverers who navigated by the stars[2]

2.2.1 NATURAL SCIENCES

2.2.2 The earth and beyond

2.2.3 The Stars

2.2.4

2.2.5 EDUCATOR SECTION

2.2.6 Memorandum

- Assignment is explained well in the module. See assessment criteria.

Hint: To give map an old appearance, it can be burnt round the edges, crumpled and painted with weak tea.

2.2.7 LEANER SECTION

2.2.8 Content

2.2.8.1 ACTIVITY: To indicate the routes taken by early discoverers who navigated by the stars [LO 2.3]

Early discoverers steered their boats using the sun by day and the stars by night and used very simple instruments to determine their direction.

Do research on the early voyages of discovery and draw a map of the world. Add captions to identify the continents and the main oceans. Give the map with a heading and indicate north. (Decide on a suitable size yourself.)

Choose two of the following voyagers and show the routes that they had taken on their voyages of discovery. If the discoverer undertook more than one voyage, this should be shown clearly.

- Bartholomew Diaz
- Vasco da Gama
- Christopher Columbus
- Ferdinand Magellan
- David Livingstone
- Marco Polo
- Robert Scott
- Francis Drake

Try to create the impression that your map is an ancient map, one that might have been used by the particular discoverer.

EDUCATOR'S ASSESSMENT

[2] This content is available online at <http://cnx.org/content/m20215/1.1/>.

CRITERIA	1	2	3	4
1. The seven continents are indicated.				
2. Oceans that are relevant to the discoveries are indicated. (Minimum)				
3. Title				
4. North indicated.				
5. Size is appropriate to amount of information that is indicated.				
6. Route(s) is/are indicated correctly.				

Table 2.2

2.2.9 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner categorises information.

2.3 To discuss the concept constellations and investigating the movement of the stars[3]

2.3.1 NATURAL SCIENCES

2.3.2 The earth and beyond

2.3.3 The Stars

2.3.4

2.3.5 EDUCATOR SECTION

2.3.6 Memorandum

Follow the directions in the module:

Question 2: Yes. West. No

Question 3: Conclusion: Every night the stars appear above the beacon four minutes earlier - the movement is westward.

2.3.7 LEANER SECTION

2.3.8 Content

2.3.8.1 ACTIVITY: To discuss the concept constellations and investigating the movement of the stars [LO 1.2, LO 2.3]

IN ANCIENT TIMES ASTRONOMERS GROUPED BRIGHT STARS THAT APPEARED TO FORM SOME KIND OF PATTERN. THESE IDENTIFIABLE PATTERNS ARE CALLED CONSTELLATIONS AND ARE NAMED AFTER PEOPLE, GODS AND ANIMALS. EACH CONSTELLATION BEARS A LATIN NAME. THE ORBIT OF THE EARTH AROUND THE SUN HAS THE EFFECT THAT SOME

[3]This content is available online at <http://cnx.org/content/m20220/1.1/>.

CONSTELLATIONS COME INTO VIEW, DISAPPEAR FROM OUR VIEW AT CERTAIN TIMES AND APPEAR AGAIN LATER DURING THE YEAR.

- Maps of the heavens that indicate the positions of the stars have been drawn for the Northern as well as the Southern Hemisphere. But there is no fixed way to draw the constellations and different "star charts" may show them differently.

THE CONSTELLATIONS OF THE SOUTHERN HEMISPHERE

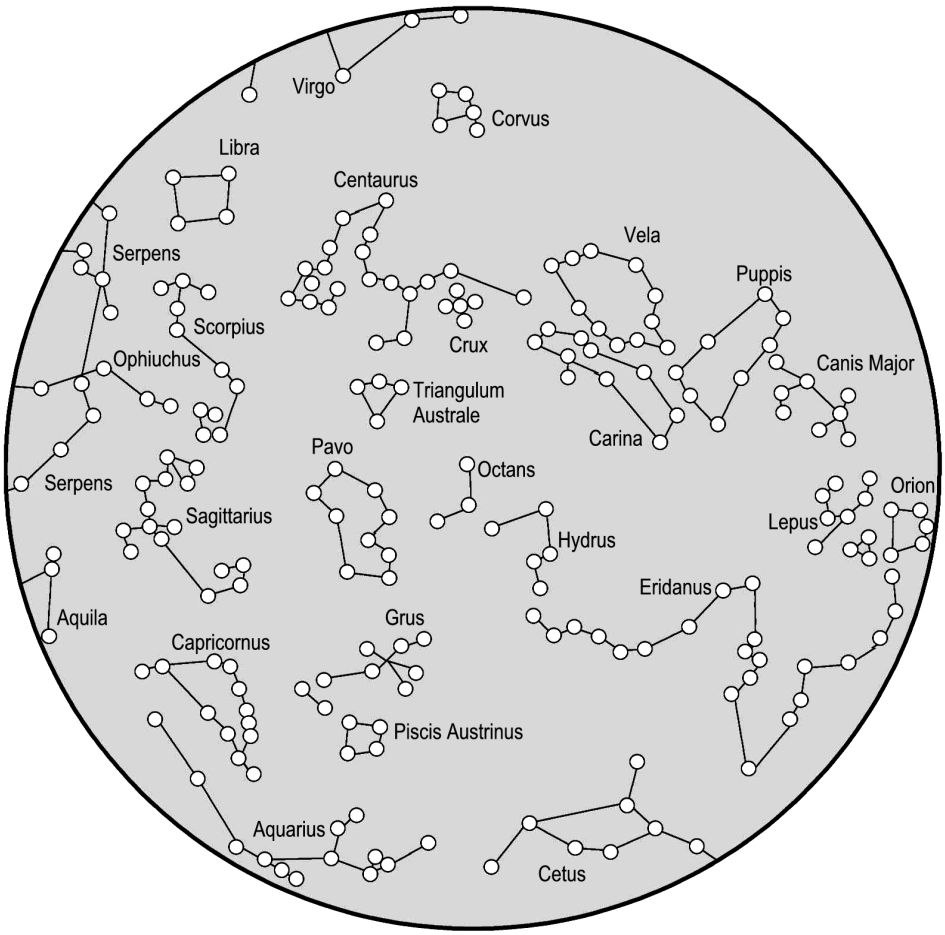


Figure 2.2

THE MOVEMENT OF THE STARS AND THE CONSTELLATIONS

- When you go out to look at constellations for the first time, it may seem impossible to detect any of them among the dense array of stars in the heavens. But once you have located a constellation, you will be able to find it easily when you try again.
- What makes it difficult to identify a constellation is the constant movement of the stars. They keep their positions with regard to each other, but they rise every evening and travel through the sky during the night.

- Some stars remain visible right through the night, but others disappear and new stars take their place. The movement is extremely slow and you will not notice it while you are simply looking up at the sky.

AN EXPERIMENT TO DETERMINE WHETHER THE STARS DO MOVE

1. Select a bright star or constellation and stand at an appropriate spot so that the star/constellation is directly above some fixed beacon (e.g. a tree or the roof of a house).

2. Note down what the time is and return to the EXACT spot one hour later.

Can you see whether the star/constellation has moved?_____

If so, in which direction (west, north, east or south)? _____

Has the position of the star/constellation shifted with regard to other stars?

_____

3. Study the position of your star/constellation over a number of consecutive evenings and record the precise time when it reaches your chosen beacon.

Evening 1	Evening 2	Evening 3	Evening 4	Evening 5
___:___	___:___	___:___	___:___	___:___

Table 2.3

Write your deduction here:

_____
_____
_____
_____
_____
_____
_____

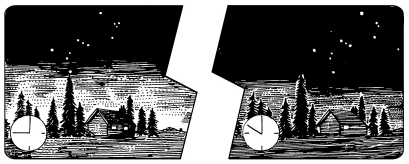


Figure 2.3

2.3.9

2.3.10

2.3.11

2.3.12 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2:**We know this when the learner**conducts investigations and collects data.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3:**We know this when the learner**categorises information.

2.4 To identify constellations and stars with the help of a planisphere[4]

2.4.1 NATURAL SCIENCES

2.4.2 The earth and beyond

2.4.3 The Stars

2.4.4

2.4.5 EDUCATOR SECTION

2.4.6

2.4.7 Memorandum

Assignment 1:

- Follow the directions in the module and let each learner make a planisphere.
- Instead of a paper clip, a thumb tick and Prestik can also be used.
- Ensure that the hours are marked as follows on the upper disk of the planisphere.

How to make the planisphere “outside”.

1. Hold the map to the light. It has to show downwards, so you can see the constellations.
2. Find the place on the upper disk where "midnight" is indicated and ensure it points south. (Ensure that the eastern and western horizons are in the correct "places".)
3. Turn the upper disk so that the precise hour lines up with the correct date on the lower disk.

4. The stars that are visible through the plastic should now also be visible in the sky above you.
   Assignment 2:
   This activity can be completed in class. To keep it simple, bear the following in mind:

- 1) provide a date, e.g. 26 May;
- 2) and a time, e.g. 21:00 or 22:00.

- Keep the times full hours and not minutes before or after the hour.
- It is important that the learners know that stars are ALWAYS in the heavens, even during the day. But we cannot see them then.

Decide in advance which date is to be given to the learners, so that enough constellations and bright stars will appear in the window of the planisphere.

[4]This content is available online at <http://cnx.org/content/m20228/1.1/>.

2.4.8 LEANER SECTION

2.4.9 Content

2.4.10 ACTIVITY: To identify constellations and stars with the help of a planisphere [LO 1.2]

- As all stars are not visible throughout the year. A planisphere, a model for assisting a viewer in finding constellations in night sky and recognising individual stars is used.

ASSIGNMENT 1

MAKE YOUR OWN PLANISPHERE

1. Draw or make a photostat copy of the following form on stiff cardboard and mark off the 24 hours of the day along the outside edge.

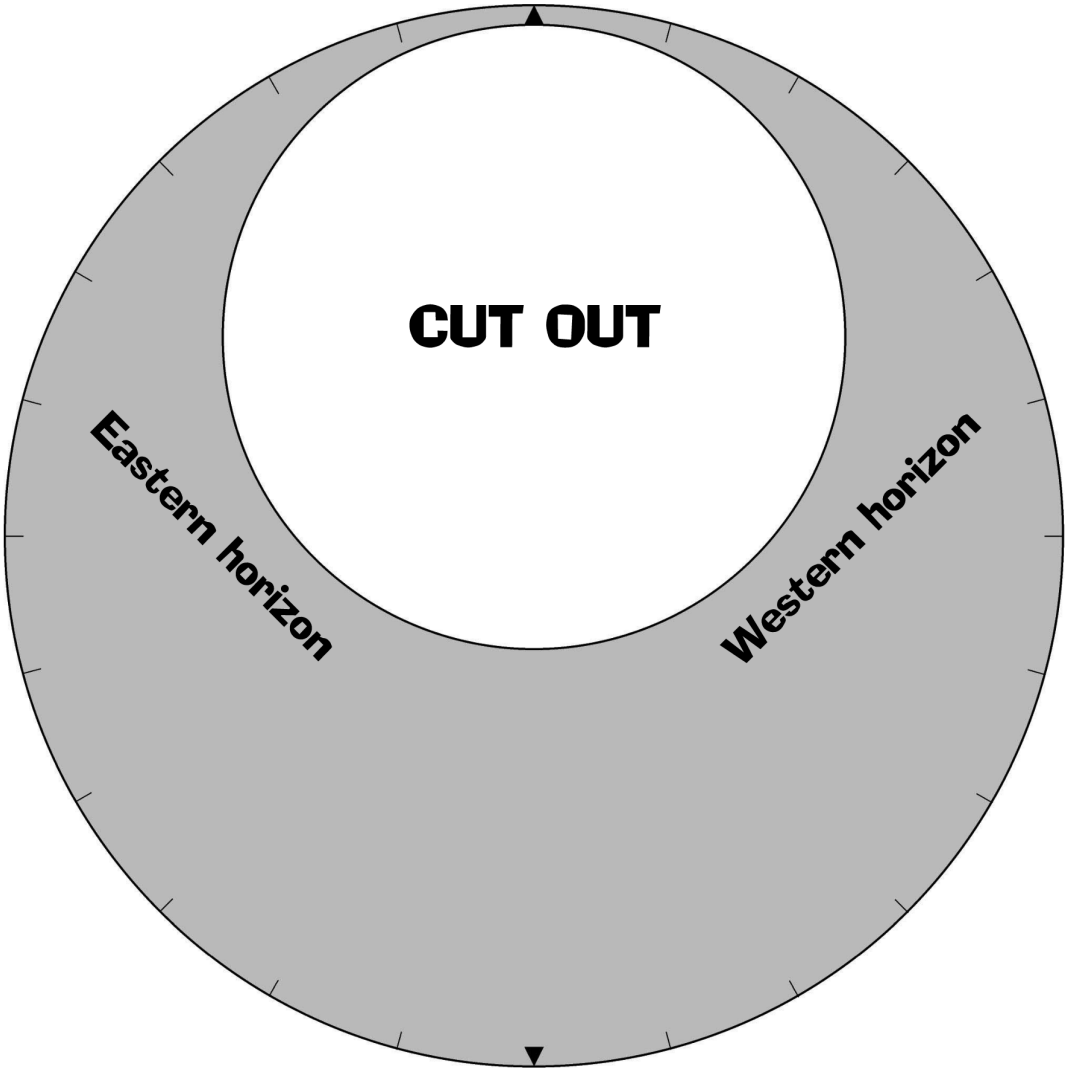


Figure 2.4

2. Cut out the section that is indicated, using a sharp cutter. Cover the opening with stiff plastic as indicated in the sketch.

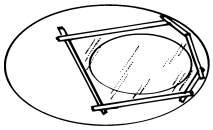


Figure 2.5

3. Photostat the following star chart of the constellations in the Southern Hemisphere: cut it out along the outer edge and glue it to the cardboard.

IMPORTANT TO KNOW:

The names of the brightest stars are shown in bold print.

4. Make a small hole in each of the circles and use a paper clip to keep them together securely on top of one another, as in the sketch.

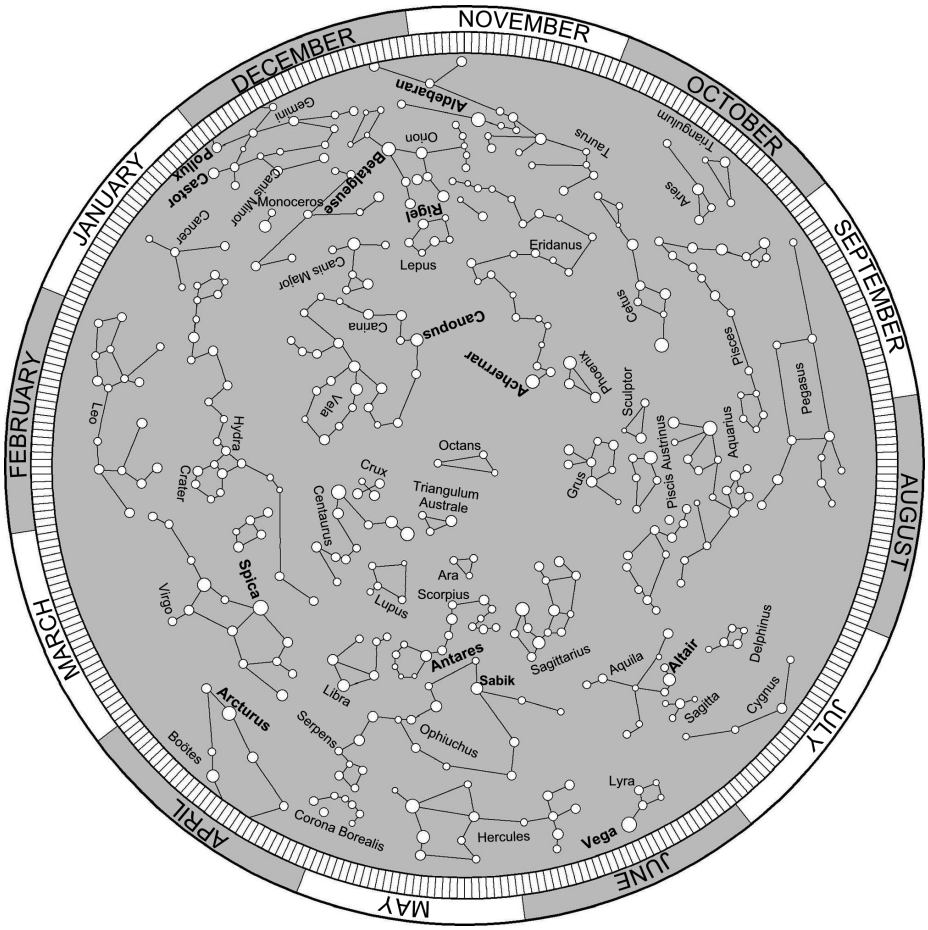


Figure 2.6

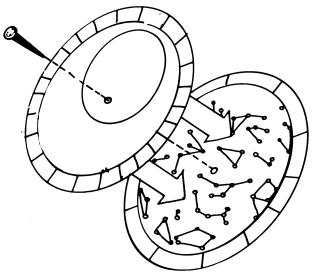


Figure 2.7

NOW USE THE PLANISPHERE AS FOLLOWS:

Rotate the top disc to align the relevant time with the date of the relevant day on the bottom disc. The constellations that are visible through the plastic window will be those that appear in the night sky on the particular date.

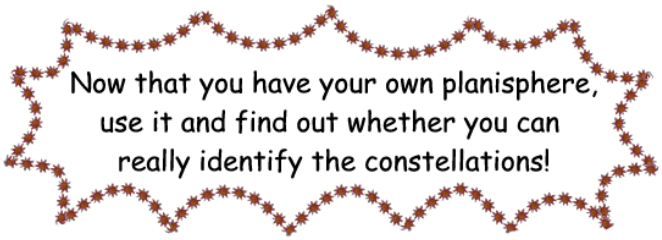


Figure 2.8

ASSIGNMENT 2

- Your educator will provide a date and a particular time. Consult your planisphere and copy down the names of all the constellations and bright stars that are visible at the particular time. Make a clear distinction between constellations and bright stars.

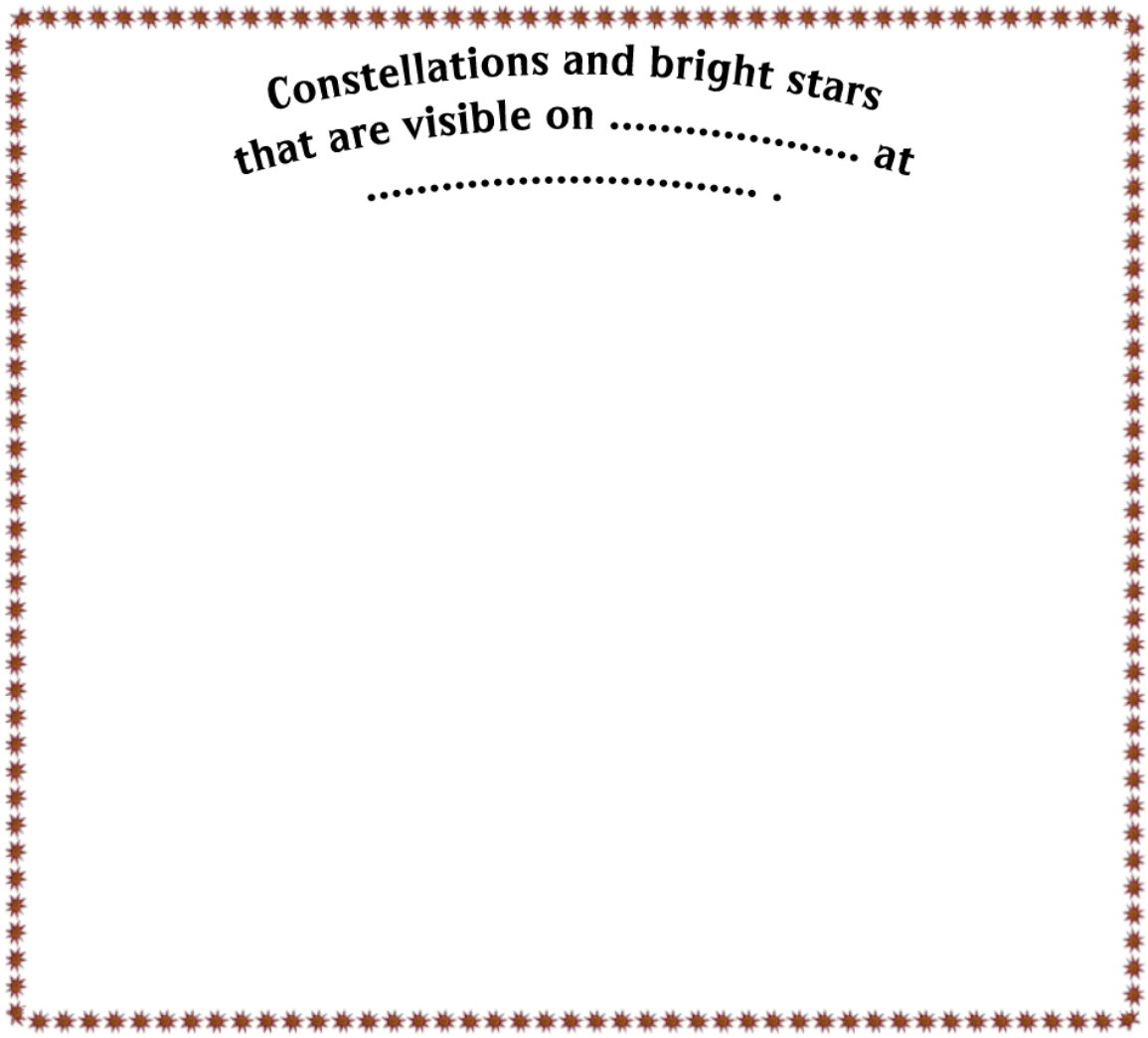


Figure 2.9

_____
_____
_____
_____
_____
_____
_____
_____

Educator's AssessmentCRITERIA	1.	2.	3.	4.
1. Constellations indicated correctly.				
2. Bright stars indicated correctly.				
3. Neatness				

Table 2.4

2.4.10.1 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2:**We know this when the learner**conducts investigations and collects data.

2.5 To talk about using stars to make predictions[5]

2.5.1 NATURAL SCIENCES

2.5.2 The earth and beyond

2.5.3 The Stars

2.5.4

2.5.5 EDUCATOR SECTION

2.5.6

2.5.7 Memorandum

Assignment 3:

1. Aries Capricorn
   Leo Gemini
   Libra Pisces
   Cancer Virgo
   Scorpio Aquarius
   Taurus Sagittarius
2. *You*, *Cosmopolitan*, *Argus*, *CapeTimes*, *Huisgenoot*, *DieBurger*, etc.

Let the learners bring various magazines and newspapers to class. Play a game to identify more magazines and papers.

[5]This content is available online at <http://cnx.org/content/m20231/1.1/>.

3. Moral norms and values are addressed. This is an important aspect that deserves attention, but that should be treated with sensitivity and circumspection.

Let learners speak to their parents / family / church about their view on horoscopes.

2.5.8 LEANER SECTION

2.5.9 Content

2.5.10 ACTIVITY: To talk about using stars to make predictions [LO 3.1]

Astronomers are scientists who study the objects in the universe and in space. Astrologers, however, are persons who interpret the movements of planets and stars and assert that this can influence the lives and behaviour of people.

- The "signs of the Zodiac", like the Ram, Lion and Scales are names that were given to twelve constellations 130 years before the birth of Christ. Astrologers use this to work out horoscopes (predictions of what may affect the daily lives of people).

ASSIGNMENT 3

1. Find out what the other signs of the Zodiac are.

_____
_____
_____
_____
_____
_____
_____
_____

2. Find out how many newspapers and magazines regularly publish horoscopes.

_____
_____
_____
_____

3. Use the opportunity to talk to your parents or other people who have authority about the desirability of consulting horoscopes regularly. Also find out what the attitude towards horoscopes is in your religion.

- Write your findings in the frame given on the next page and decorate the page.

Horoscope: Our family's/belief's point of view.

2.5.11 Assessment

Learning Outcome 3:**Science, SOCIETY and the environment**The learner will be able to demonstrate an understanding of the interrelationships between science and technology, society and the environment.

Assessment Standard 3.1:**We know this when the learner** understands science and technology in the historical context.

2.6 To find out how african peoples used the position of the stars to their advantage[6]

2.6.1 NATURAL SCIENCES

2.6.2 The earth and beyond

2.6.3 The Stars

2.6.4 EDUCATOR SECTION

2.6.5 Memorandum

Assignment 4:

1. Remote areas
2. No access to newspapers, magazines, TV and radio
3. Do/does not own a calendar
4. Maybe completely illiterate
5. Still believe/believes in the traditions and customs of forefathers
6. OTHER POSSIBILITIES

2.6.6 LEANER SECTION

2.6.7 Content

2.6.7.1 ACTIVITY: To find out how african peoples used the position of the stars to their advantage [LO 3.1]

- The Vendas see the stars that form the Southern Cross and accompanying stars as giraffes. The giraffe stars appear above the horizon just after sunset in October, to remind the people that it is time to prepare to plant their crops.
- The Xhosas also wait for the appearance of the Southern Cross to begin their sowing. The constellation appears towards the end of winter. When it appears they know that it is time to start ploughing the fields.
- The Tswana people tell the story of how a crocodile swallows the sun each evening and spits it out again in the morning.
- Chinese people used to believe that an eclipse of the sun occurs when a dragon tries to swallow the sun. At such times they used to beat drums and shout to frighten off the dragon.

ASSIGNMENT 4

- Explain why African peoples had to rely on the constellations to determine the time for planting crops. Try to supply at least three reasons.

1._____
_____
2._____
_____
3._____
_____

[6]This content is available online at <http://cnx.org/content/m20232/1.1/>.

2.6.8 Assessment

Learning Outcome 3:The learner will be able to demonstrate an understanding of the interrelationships between science and technology, society and the environment.

Assessment Standard 3.1: We know this when the learner understands science and technology in the historical context.

2.7 To discuss igneous rocks as a type of rock formation [7]

2.7.1 NATURAL SCIENCES

2.7.2 The earth and beyond

2.7.3 Rock Formations

2.7.4

2.7.5 EDUCATOR SECTION

2.7.6

2.7.7 Memorandum

Igneous rock

1. cracks in the earth's crust

Key

2. earth's crust
3. lava cools and solidifies as grey / black basalt
4. red molten lava
5. crater of the volcano
6. magma forms lava

Assignment 5:

1. Magma (lava) will cool quickly as soon as it has erupted from the volcano and runs down the mountain slope

Reason: Little lava, exposed to the "cooler" atmosphere.

2. Granite is found deep underneath the crust

Reason: Magma has to cool slowly in order to form granite.

3. Deep underneath the earth's crust.
4. Deep underneath the earth's crust.

Reason: The surrounding rocks keep the magma hot for a very long time. Therefore, it cannot cool quickly.

5. Basalt is found on the slopes of the volcano.

Reason: Basalt forms when lava cools quickly. It has to be outside the crust.

6. The smallest crystals appear in basalt - thus on the mountain slopes and valleys near the volcano.

2.7.8 LEANER SECTION

2.7.9 Content

WE ARE GOING TO STUDY THE DIFFERENT TYPES OF ROCK FORMATION

THAT FORM THE CRUST OF THE EARTH BECAUSE SEEDS DO NOT GROW EQUALLY WELL IN ALL KINDS OF SOIL.

[7] This content is available online at <http://cnx.org/content/m20234/1.1/>.

- Rocks, refers to the material that forms the earth's crust. Rock formations are grouped in three categories, namely igneous rocks, sedimentary rocks and metamorphic rocks.

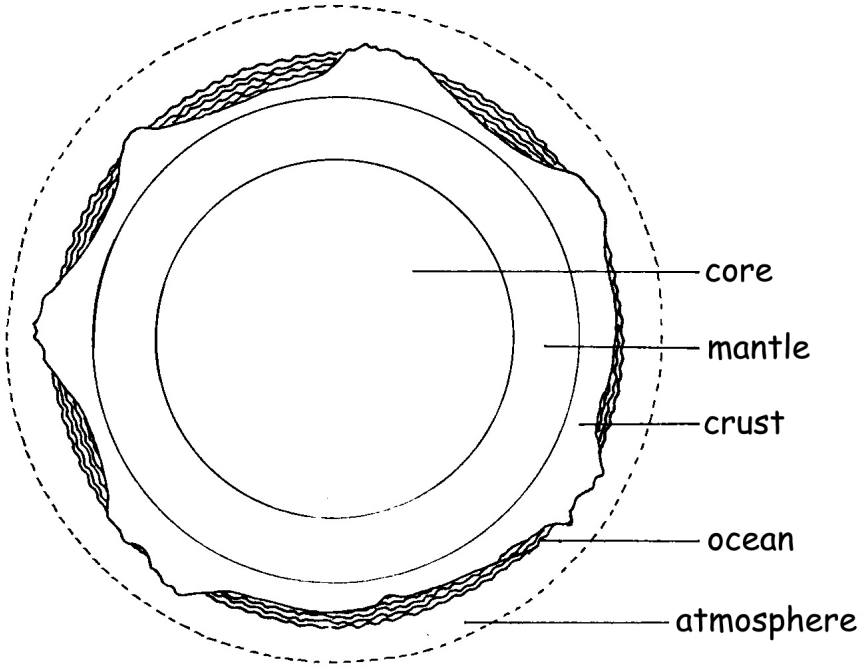


Figure 2.10

2.7.10 ACTIVITY: To discuss igneous rocks as a type of rock formation [LO 2.1]

- These rocks are the primary, original rock formation that made up the surface of the earth.
- The earliest rock formations were igneous rocks that were formed when the planet started to cool down. The rocks are extremely hard and consist of several crystals.

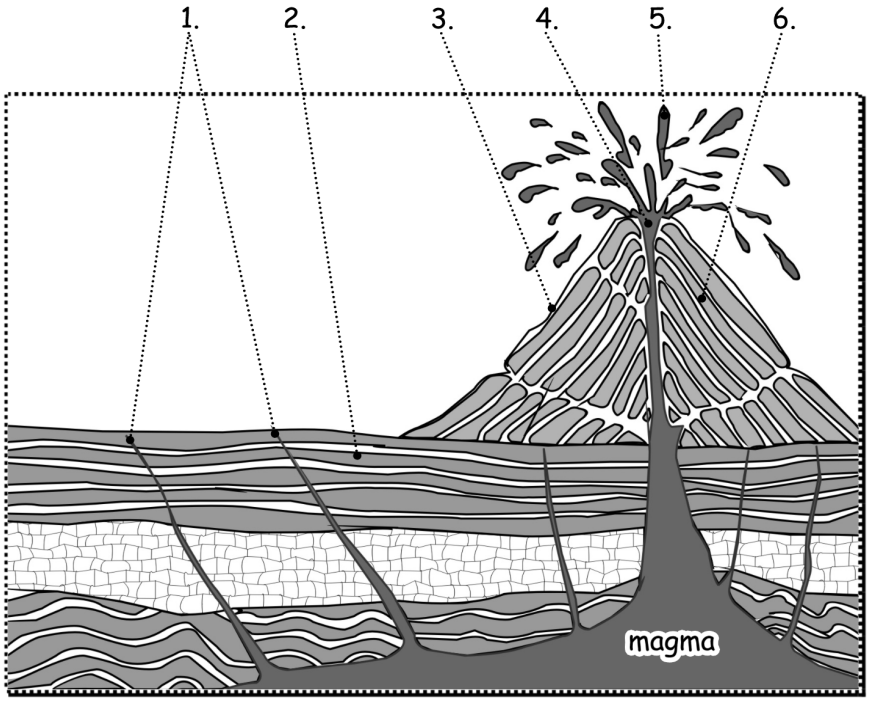


Figure 2.11

2.7.10.1 Section through a volcano

KEY

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

We can work out how igneous rocks were formed by noting what happens to lava when there is a volcanic eruption. Lava cools down when it runs down the mountain slopes and begins to harden.

- Basalt is formed after the eruption of a volcano. The lava cools down quickly, the crystals are small and the colour varies between dark grey and black. Sometimes the rock is perforated with small openings that are formed by small gas bubbles. This type of rock is used for pumice stone, which is used by people for rubbing off hardened dry skin on their feet.

Before the molten rock appears on the surface of the earth it is known as **magma**.

Figure 2.12

- The best-known rock formed from magma is granite. Granite is formed when magma cools down slowly below the surface of the earth. It is a very hard rock and mainly consists of white, black and cream-coloured crystals. The minerals in this type of rock are able to form larger crystals because the magma cools down so slowly.

ASSIGNMENT 5

Study the following diagram and answer the questions:

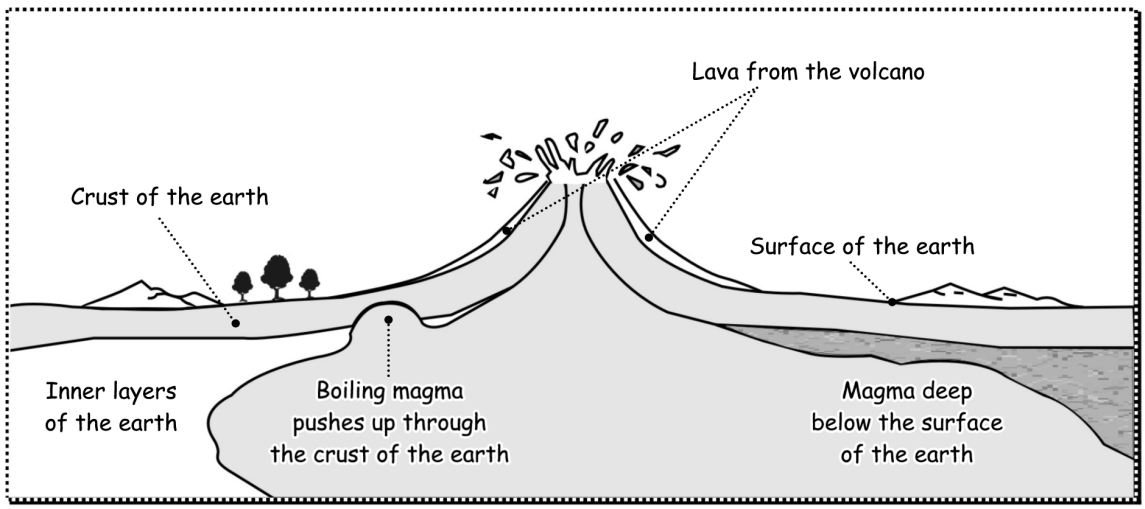


Figure 2.13

1. Where will the magma be able to cool down the soonest? Why?

_____
_____
_____
(2)

2. Where do we find granite? Explain why.

_____
_____

_____
(2)
3. Where will the largest crystals be found when the magma starts to harden?
_____
_____
_____
(1)
4. Where will the magma cool down the slowest? Why?
_____
_____
_____
(2)
5. Where will we find basalt? Explain why.
_____
_____
_____
(2)
6. Where will the smallest crystals be found?
_____
_____
_____
(1)
Summative: 10

2.7.11 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1:We know this when the learnerrecalls meaningful information.

2.8 To discuss sedimentary rocks as a type of rock formation[8]

2.8.1 NATURAL SCIENCES

2.8.2 The earth and beyond

2.8.3 Rock Formations

2.8.4

2.8.5 EDUCATOR SECTION

2.8.6

2.8.7 Memorandum

Sedimentary rock formations formed by earlier life forms

- **Sketch:** The search for fossil fuels (oil)

Key:
1. Oil drill
2. Ocean

[8]This content is available online at <http://cnx.org/content/m20239/1.1/>.

1. Ocean floor

1. Penetrable rock
2. Pipeline
3. Oil
4. Sedimentary rock

8. Impenetrable rock

Sedimentary rock formations:

Layers of rock on the earth's surface and under water. Formed by debris or earlier life. Debris type forms through the breaking up of rocks and the scattering of the pieces by wind and water to lower levels where they form sand and mud. The ones formed by earlier life are created by the compression of skeletons to form limestone.

2.8.8 LEANER SECTION

2.8.9 Content

2.8.10 ACTIVITY: To discuss sedimentary rocks as a type of rock formation [LO 2.3]

- Large areas of the earth are covered in sedimentary rocks. These rocks are not formed on the surface of the earth only, but frequently also under water. The formations occur in layers.

- Scientists distinguish between two kinds of sedimentary rock.

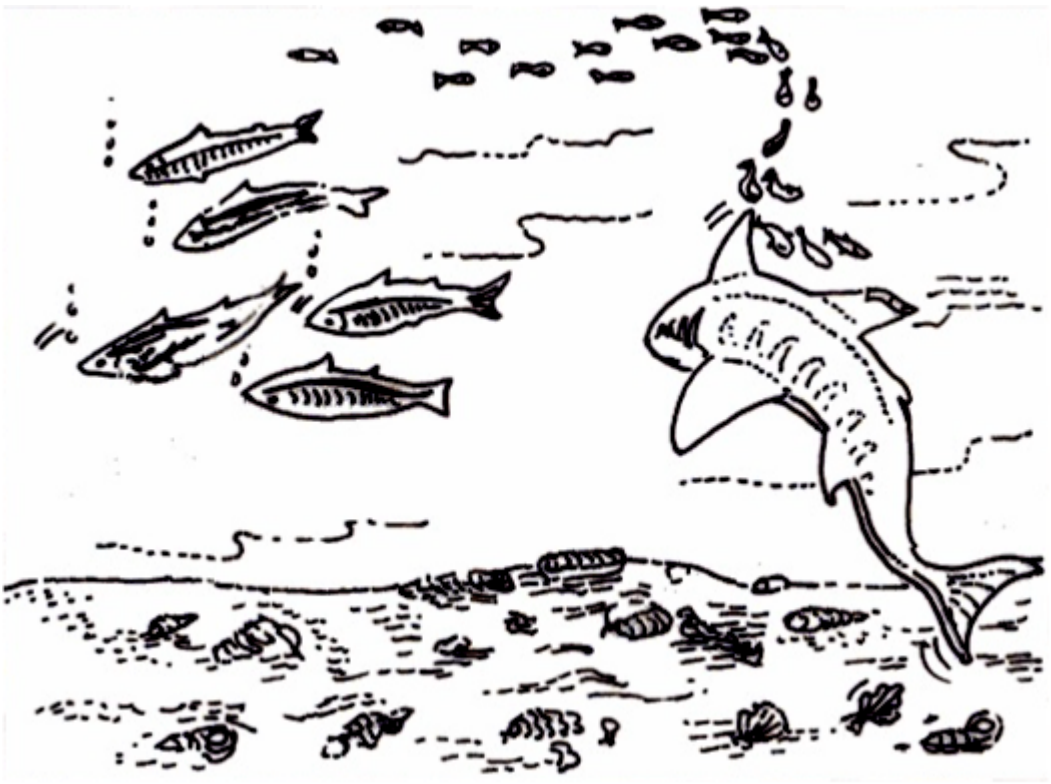
SEDIMENTARY ROCK FORMED BY "RUBBLE":

- Existing rocks are broken down through the action of wind and water. The small bits of rock that result from this are carried along in streams and rivers until they reach the sea, where it is deposited as layers of sand and mud.

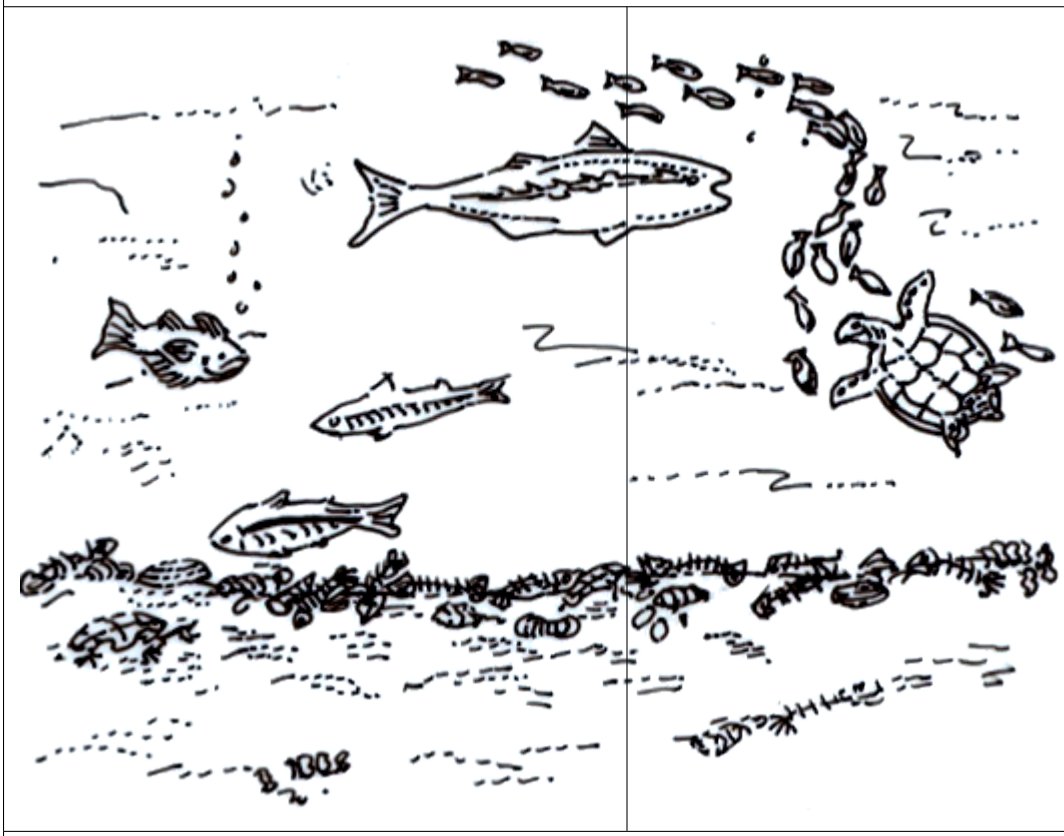
SEDIMENTARY ROCK FORMED AS A RESULT OF EARLY LIFE:

- These rocks consist of material from organisms that were alive in very early times.

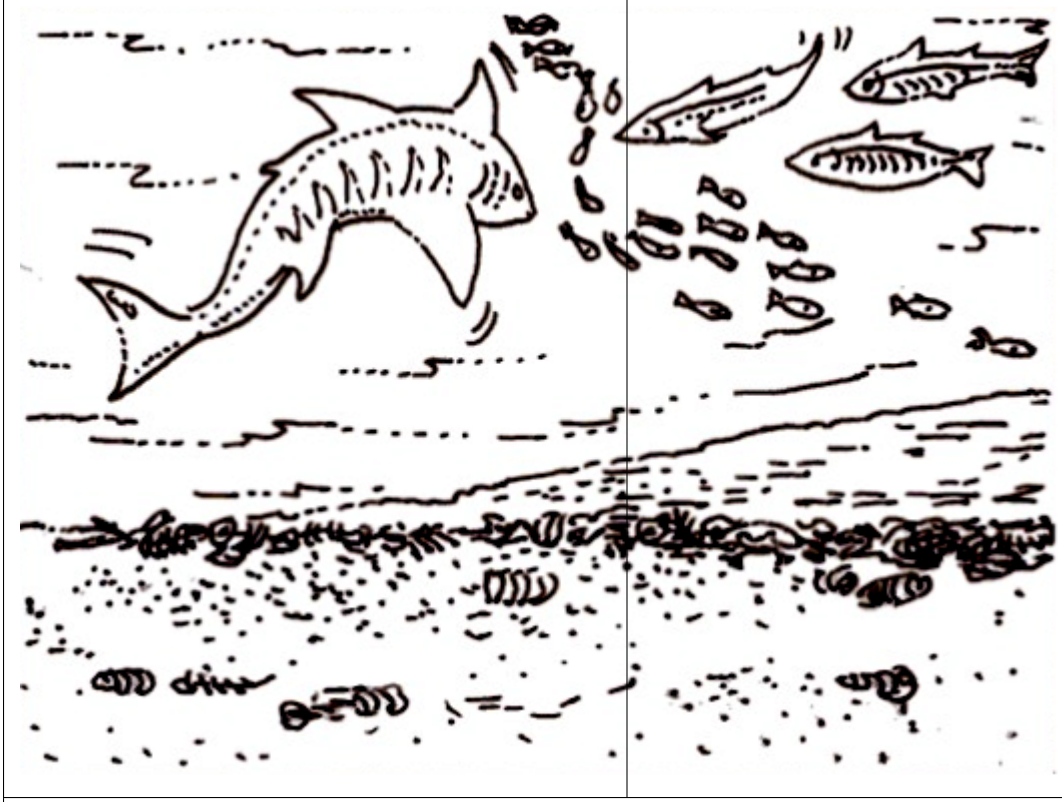
- The following illustrations show how these rocks were formed:

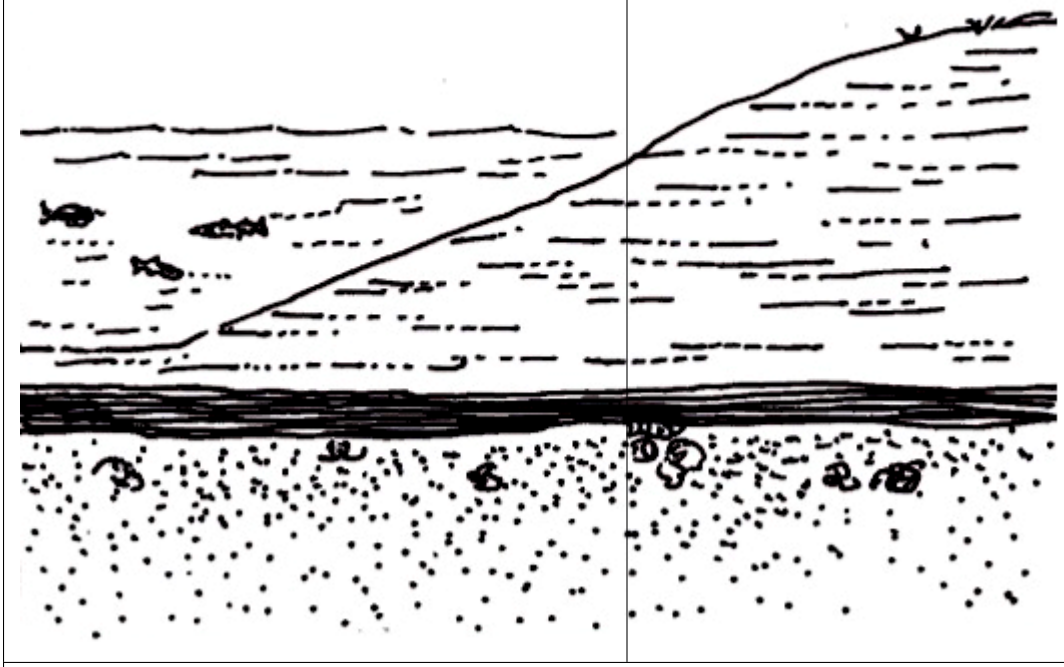


1. When fish and other organisms that live in the sea die, their remains sink to the bottom of the sea.



continued on next page

2. Their skeletons and the calcium of their shells form layers on the sea floor.	
	
continued on next page	

3. With many years passing, the layers become compressed. They become thick layers of rock known as limestone.	
	

continued on next page

4. These are the main rocks that we see because they are formed on the surface of the earth. They usually are soft.	

Table 2.5

- Sedimentary rocks are of importance to people because they provide people with oil, earth gas, coal and stone for building. Sometimes they also contain fossils that provide information about what the earth was like millions of years ago. We'll be learning more about fossils in the rest of the module.

- Provide captions for the sketch:

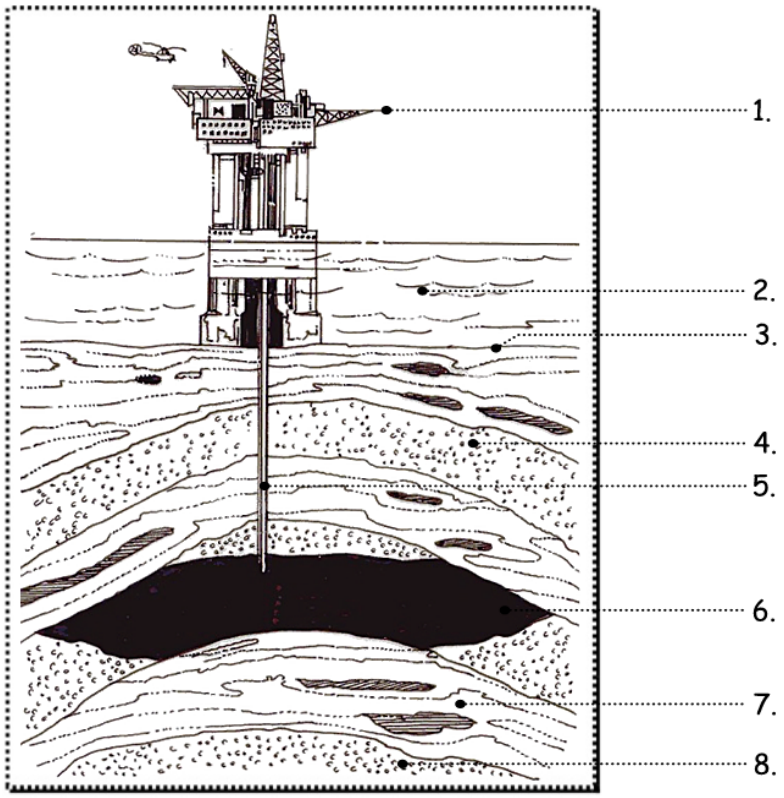


Figure 2.14

The search for fossil fuels (petroleum)

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

- Explain what you know about sedimentary rocks (in thirty words). Use your own words.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

2.8.11 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3:We know this when the learnercategorises information.

2.9 To discuss metamorphic rocks as a type of rock formation[9]

2.9.1 NATURAL SCIENCES

2.9.2 The earth and beyond

2.9.3 Rock Formations

2.9.4

2.9.5 EDUCATOR SECTION

2.9.6

2.9.7 Memorandum

- Find out more:

Uses for slate

- Garden paths
- Paving tiles, etc.

Uses for marble

- Kitchen surfaces
- Gravestones, etc.

Assignment 6:

[9]This content is available online at <http://cnx.org/content/m20243/1.1/>.

Sedimentary	Metamorphic
Newly formed from rocks or the remains of animals that died.	Pre-existing rock that changes due to pressure or heat.
Softer	Harder

Table 2.6

2.9.8 LEANER SECTION

2.9.9 Content

2.9.10 ACTIVITY: To discuss metamorphic rocks as a type of rock formation [LO 2.1]

- Metamorphic rocks are formed when existing rocks are changed through great pressure or heat. This metamorphosis or change takes place over a VERY long period of time because the rock has to be at a particular depth below the earth surface where it is exposed to the extreme heat and pressure that is required. After it is formed, it may easily take 100 million years for the earth surface to be changed sufficiently by erosion for these rock formations to be exposed.
- Slate is formed when very high pressure is exerted on existing rock.

- Marble is formed when extreme heat is exerted on existing rock.

Figure 2.15

ASSIGNMENT 6

- Explain how metamorphic rock differs from sedimentary of rock formations.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Educator's AssessmentCRITERIA	1.	2.	3.	4.
1. Are the three types of rock dealt with adequately?				
2. Have the most important aspects been mentioned?				
3. Was any source besides the module consulted?				
4. Does the learner exhibit insight with regard to rock formations?				

Table 2.7

2.9.11 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1: We know this when the learner recalls meaningful information.

2.10 To explain how fossils were formed[10]

2.10.1 NATURAL SCIENCES

2.10.2 The earth and beyond

2.10.3 Fossils

2.10.4

2.10.5 EDUCATOR SECTION

2.10.6

2.10.7 Memorandum

Assignment 7:

Ensure that a dictionary of definitions is available in class.

1. 100 years

2. About three quarters of South Africa consisted of a large marshy bowl. These unique conditions are ideal for fossilisation.

3. When something in nature dies, it is normally eaten and scattered by scavengers. These bones, that are often scattered widely, are then covered in mud and sand.

4. True. Fossils represent people, plants and animals that lived millions of years ago. We can derive a lot from them.

5. A fossil is any remains of a human being, animal or plant that remained intact in the rock formations of the earth.

6. Shells are mostly too hard to be eaten. They are part of the invertebrates that make up a large portion of the animal kingdom. A lot of fossilisation happened in water.

7. Teeth consist of bone covered by enamel. Bone is the hardest tissue in the body. Teeth are well protected against decay, because they are already mineralised.

8. A scientist manages a specific section of knowledge that consists of systematically arranged facts based on general principles.

A scientist is a person who has expert knowledge of one or more of the natural or physical sciences. (Paperback Oxford English Dictionary 2001)

[10]This content is available online at <http://cnx.org/content/m20249/1.1/>.

9. Paleo is a prefix meaning older or ancient. (Paperback Oxford English Dictionary 2001)

2.10.8 LEANER SECTION

2.10.9 Content

FOSSILS CAN PROVIDE IMPORTANT INFORMATION ABOUT THE HISTORY OF LIFE ON EARTH. WE FIND FOSSILS IN ROCK LAYERS. THEY ARE THE REMAINS OF PEOPLE AND PLANTS, AS WELL AS SKELETONS AND SHELLS OF ANIMALS THAT WERE ALIVE IN THE DISTANT PAST. THE ROCK LAYERS IN WHICH WE FIND FOSSILS ARE KNOWN AS SEDIMENTARY ROCKS. FOSSILS ARE VERY IMPORTANT FOR OUR ATTEMPTS TO RECONSTRUCT THE PREHISTORIC ENVIRONMENT OF OUR ANCESTORS BECAUSE PLANTS AND ANIMALS PROVIDE INFORMATION ABOUT NATURE.

- Anything that gives visual proof of past life can be called a fossil. Petrified bones and teeth provide the best fossils from prehistoric people. Bone is the hardest tissue in the body and can therefore be preserved much more easily than anything else. Footprints, tools, burnt bones from the prey that they hunted for food and remains of shells that were collected serve as fossilised proof of their way of living.

2.10.10 ACTIVITY: To explain how fossils were formed [LO 1.2, LO 2.3]

- It is not easy to fossilise anything. Scavengers quickly consume any creature that dies in nature and the bones become scattered. As the years pass, these remains are covered with sand and mud. This is why we hardly ever discover complete fossilised skeletons. With the passing of the centuries more and more sand and mud are deposited over the bones. The sand and mud gradually become petrified and bones of prehistoric animals and shells are conserved and even become hard and rock-like.

- Sometimes the rock crumbles or is eroded by the sea or a river, so that some of the fossils are revealed on the surface. Shells are the most common fossils, but bones from large reptiles are found quite frequently right across the world. Bones and shells are not the only things that are conserved below the ground. Even marks made by raindrops have already been discovered. The petrified faeces of some animals are among the strangest fossils that have ever been found. These are known as coprolites.

Figure 2.16

A representation of a footprint made by an Apatosaurus that was found in England. Each footprint of the dinosaur measures about 1 metre. The sets of prints indicate that these animals sometimes wandered around in herds. The three-toed footprint possibly belonged to a meat-eating dinosaur that hunted the Apatosaurus.

- Usually only the hardest parts of an animal become fossilised. The softer parts of the body decay, but may leave imprints in the rock. Plant fossils usually take the form of leaf imprints or petrified tree trunks. Fossils of microscopic grains of pollen have also been found.
- Fossils therefore are links with the past. But fossilisation is a unique process that only occurs under particular circumstances. Millions of years ago in South Africa, the conditions in the Karoo were very favourable for fossilisation.
- At that time, the Karoo was a large marshy depression that comprised about three-quarters of the present South Africa. Rivers flowed from the mountains to the depression. Plant fossils provide proof of forests and trees along the riverbeds. The rivers teemed with fish, reptiles and large amphibians, but no signs of birds or mammals have been found. About 190 million years ago tremendous volcanic eruptions occurred in the Karoo because Gondwanaland had started to break up to form the continents that we know today. Large areas were covered in lava and animals were driven away.
- This means that thousands of well-preserved fossils were conserved in the Karoo.

PALAEONTOLOGISTS

- People who study fossils are known as palaeontologists. Palaeethnologists study prehistoric people, while palaeobotanists study plant fossils and palaeozoologists study the remains of animals. When all the information obtained in this way is combined, scientists are able to determine what the prehistoric environment was like.

- There are very few fossils that have human appearance because people probably lived in areas where fossilisation did not take place easily. Humanoid fossils usually are remains of the prey caught by carnivores. There also seems to be fewer humanoid fossils dating from the time after people learnt to use fire. It is possible that fire enabled people to scare carnivores out of caves.

ASSIGNMENT 7

Read the above attentively before answering the following questions. Use a dictionary as source, if necessary.

1. How long is a century?

_____
(1)

2. Why has the Karoo provided so many well-preserved fossils?

_____
(1)

3. Why do we hardly ever find complete fossilised skeletons?

_____
_____
(1)

4. Is the following statement TRUE or FALSE? Motivate your answer.
FOSSILS CAN BE SEEN AS PROOF OF EARLY LIFE.

_____
_____
(2)

5. Using your own words, give an abbreviated definition of a fossil.

_____
_____
_____
_____
(1)

6. Why would you regard shells as the most common fossils?

_____

_____
(1)
7. Why do the teeth of prehistoric people sometimes provide the best fossils?
_____
_____
(1)
8. Explain what a scientist is, by means of a brief definition of the word.
_____
_____
_____
_____
(1)
9. What is the meaning of the prefix "palaeo-", as used in the following words: palaeethnologists, palaeobotanist and palaeozoologist?
_____
_____
_____
_____
(1)
TOTAL: 10

2.10.11 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2:**We know this when the learner**conducts investigations and collects data.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3:**We know this when the learner**categorises information.

2.11 To talk about the reconstruction, identification and conservation of fossils[11]

2.11.1 NATURAL SCIENCES

2.11.2 The earth and beyond

2.11.3 Fossils

2.11.4

2.11.5 EDUCATOR SECTION

2.11.6

2.11.7 Memorandum

Assignment 8:

Identification of fossils

1. Coral

[11]This content is available online at <http://cnx.org/content/m20255/1.1/>.

2. Found in rock layers near Ceres in the Western Cape. These corals were formed in the sea approximately 400 million years ago.
3. Cycad family
4. Grows well in any moist, sheltered area.
5. Very high temperatures
Evaporation
Earth movement that caused water to drain away
Over-utilisation of nature, etc.
6. In the deeper rocks

2.11.8 LEANER SECTION

2.11.9 Content

2.11.10 ACTIVITY: To talk about the reconstruction, identification and conservation of fossils [LO 1.2, LO 2.3]

RECONSTRUCTION OF THE FOSSIL OF A DINOSAUR

- Some dinosaur fossils are discovered accidentally when layers of rock in valleys, precipices and desert hills are revealed by means of erosion after millions of years. Sometimes mineworkers or road builders may uncover such layers.
- When a palaeontologist finds a fossil, the location is recorded very carefully. Each scattered bone is numbered. Then loose-lying bones are gathered and taken away to be studied. Bones embedded in rocks are removed with extreme care. Sometimes surrounding rocks are shovelled away, but when the fossilised bones are exposed, palaeontologists use chisels, hammers and drills. As soon as the upper half of a fossil is exposed, it is covered with damp paper. It is then wrapped in bandages soaked in plaster of Paris. This hardens and forms a protective shell over the fossil. The surrounding soil is then scraped away and the fossil is turned over, so that the remaining half of the fossil can be treated in the same way. When the whole fossil is completely covered with a protective shell, it is carefully transported to a museum.
- At the museum, the protective shell is removed and the remaining rock is chiselled off the fossil. This process may take years and bones sometimes have to be reinforced with plastic because it begins to crumble. The exact position of each bone is determined before the fossil is reassembled. Sometimes wires, rods and structures of steel are used in the reconstruction of a fossil. Missing parts are built up or obtained from other fossils. If this reconstruction is not done, we would not have known what dinosaurs really looked like.

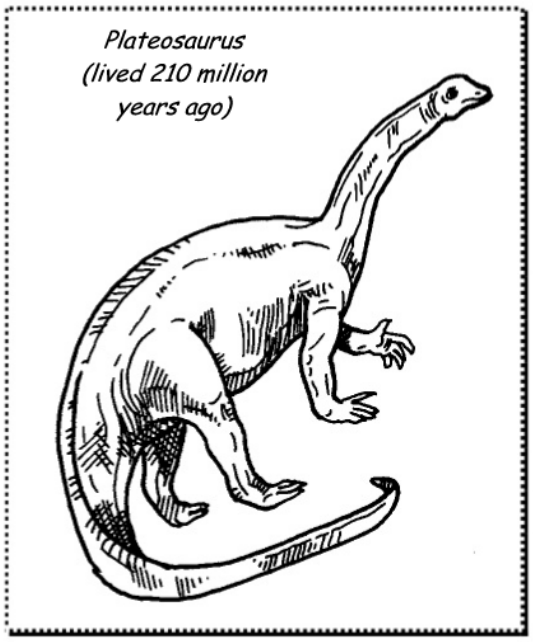


Figure 2.17

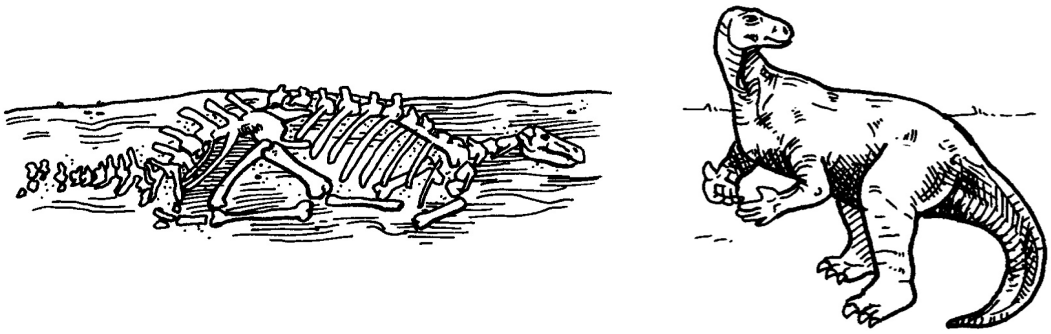


Figure 2.18

IDENTIFICATION OF FOSSILS
ASSIGNMENT 8

- Study the following representations of fossils and answer the questions:

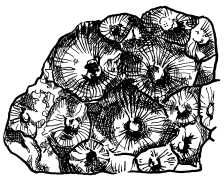


Figure 2.19

1. What is this fossil called nowadays?

2. Where do we normally find this fossil in colonies?

Figure 2.20

Williamsonia

3. Which tree family above shows a resemblance with this fossilised leaf?

4. Centuries ago, this was only found in tropical forests. Where can it be found today?

Figure 2.21

5. The above picture represents a fossilised Gosiutichthys (a fish). The fish died when the lake in which it lived dried up. Supply three possible reasons for the drying up of a lake.

_____
_____
_____
_____

6. It is important to be able to determine the age of fossils. This can be done by different means. Sometimes scientists compare the amount of gas in a rock sample with the amount of lime in the original rock to determine the age of the fossil.

The age of fossils can also be determined by means of radioactivity.

Where would we find the oldest fossils - in shallower or in deeper layers of rock?

_____

CONSERVATION OF FOSSILS

- Fossils can also be conserved in moulds. When a portion of bone has become petrified in a hard rock formation, it can be eroded but leaves an exact imprint in the rock. Such an imprint is known as a casting mould.

GROUP WORK

Making a casting mould of your hand.

REQUIREMENTS:

a tray of wet sand;
a strip of cardboard (5 cm x 38 cm);
Plaster of Paris;
water;
paperclips.

METHOD:

- Flatten the sand and press your hand on it firmly enough to leave an imprint.
- Position the cardboard strip around the imprint and secure the ends with a paper clip.
- The strip of cardboard should be pushed into the sand to form a raised edge around the imprint.
- Mix sufficient Plaster of Paris to fill the cardboard to just below the rim.
- Allow the plaster to set and dry.
- Remove the strip of cardboard and lift the plaster of Paris off the sand.

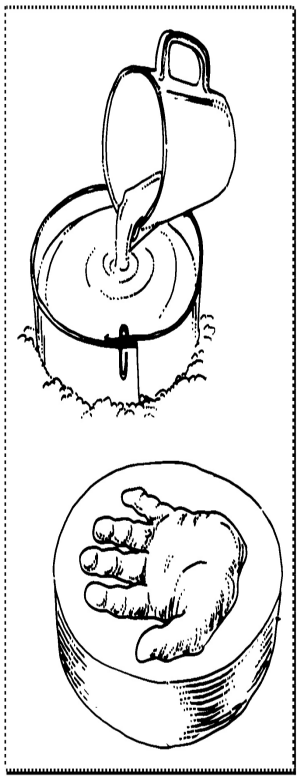


Figure 2.22

Assessment Criteria	1.	2.	3.	4.
1. Knowledge and understanding of fossils (LO 2.3)				
2. Experiment (LO 1.2): Instructions followed.				
3. Finish: precise				
4. Cooperation within group				

Table 2.8

2.11.11 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.2:**We know this when the learner**conducts investigations and collects data.

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3:**We know this when the learner**categorises information.

2.12 To discuss the ways in which organisms change over time[12]

2.12.1 NATURAL SCIENCES

2.12.2 The earth and beyond

2.12.3 Fossils

2.12.4

2.12.5 EDUCATOR SECTION

2.12.6

2.12.7 Memorandum

Assignment 9:

- They lived in forests earlier.
- It was not necessary for them to be able to run fast.
- Shorter legs were sufficient for survival in forests.
- Found in open plains today.
- Must be able to run fast (from enemy).
- Longer, more muscular legs help them survive.
- Used to ride and to pull carts.
- Became bigger and stronger in order to be an efficient mode of transport.

2.12.8 LEANER SECTION

2.12.9 Content

2.12.10 ACTIVITY: To discuss the ways in which organisms change over time [LO 2.3]

TO SURVIVE, PLANTS AND ANIMALS CONTINUALLY NEED TO CHANGE IN ORDER TO ADAPT TO THEIR ENVIRONMENTS.

THE ENVIRONMENT, HOWEVER, ALSO CHANGS.

THIS IS WHY ANIMAL LIFE HAS CHANGED THROUGH THE CENTURIES.

- In the period of the dinosaurs the world was mainly dry and hot. The climate started changing gradually, new animals and plants evolved and others died out. When the climate became warmer and wetter, great forests of giant ferns and a variety of conifers developed. The changing world required the dinosaurs to adapt as well in order to survive. Flowering plants and blossoming trees appeared about 100 million years ago and oak and laurel forests began to grow. Birds, insects and other animals started to develop to eat the nectar and pollen provided by the flowers.
- The dinosaurs disappeared, but their descendants remained behind. When we examine dinosaur fossils it becomes clear that the crocodiles and birds are the closest living relatives of the dinosaurs. The dinosaurs were reptiles. Reptiles actually developed 300 million years ago. Even before the appearance of the dinosaurs, reptiles had developed along different lines to form different groups.

CHANGES IN ORGANISMS:

[12] This content is available online at <http://cnx.org/content/m20259/1.1/>.

- Some creatures, e.g. the cockroach, have shown hardly any change over millions of years. Horses once were as large as a terrier and lived in forests. Nowadays they are fast long-legged animals that live on the open plains. This kind of change results from a process of natural selection.

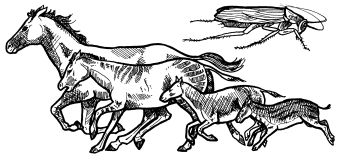


Figure 2.23

Prehistoriese Lewe, Van den Heever et al., p. 19
ASSIGNMENT 9

- Discuss the reasons for the above adaptations of horses in your groups, to begin with. Then write a paragraph and supply at least five possible causes of this change.

Educator's AssessmentCRITERIA	1.	2.	3.	4.
1. Assignment completed correctly.				
2. Meaningful content.				
3. Reveals creative thinking.				

Table 2.9

2.12.11 Assessment

Learning Outcome 2:The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3:**We know this when the learner**categorises information.

2.13 To discuss the role of rivers in nature[13]

2.13.1 NATURAL SCIENCES

2.13.2 The earth and beyond

2.13.3 Rivers and their catchment areas

2.13.4

2.13.5 EDUCATOR SECTION

2.13.6

2.13.7 Memorandum

Assignment 10:

1. Assignment clear in module. Assignment can lead to an exhibition of collected samples, photos and notebooks.

Follow-up visit for cleaning up is recommended.

Assignment 11:

Listen at least to Wendy Oldfield's song "Acid Rain". Learners take the lead and answer the following question:

"Which environmental issues are addressed and what solutions do we have for the problems?"

Assignment 12:

Help the learners with a framework, e.g.

- The river as an environment wherein plants and animals can live

- light
- visibility
- oxygen
- no poison
- protection against temperature changes

- Life in a river (above-mentioned environment)

- types of plants
- types of animals
- mutual dependence of plants and animals

2.13.8 LEANER SECTION

2.13.9 Content

2.13.10 ACTIVITY: To discuss the role of rivers in nature [LO 1.1, LO 1.2]

IN THE LEARNING UNIT DEALING WITH FOSSILS WE SAW THAT THE DRY KAROO USED TO BE A MARSHLAND THAT COVERED APPROXIMATELY THREE-QUARTERS OF THE SURFACE AREA OF SOUTH AFRICA. IT IS CLEAR THAT FRESH WATER HAS PLAYED AN IMPORTANT ROLE IN THE LIVES OF PLANTS AND ANIMALS AS WELL AS PEOPLE FOR MILLIONS OF YEARS.

A RIVER IS MORE THAN WATER!

[13] This content is available online at <http://cnx.org/content/m20260/1.1/>.

- Rain absorbs carbon dioxide and oxygen when it travels through the atmosphere. While it travels down a mountain slope, tiny plant particles from the vegetation are also caught up in it. In this way water takes up sufficient soluble nutrients to sustain animals that live in water, as well as plants.
- Rivers are generally endangered. The fact that people need water for survival, places a great deal of pressure on rivers to meet this need and to carry away waste material.
- Rivers are not drainage conduits for the removal of waste: they are complex systems.
- Different plants and animals exist along the different reaches of a river. These organisms utilise the natural materials contained in the river in the natural process of their lives. This ensures that the water in the river is purified continually. Rivers are also able to absorb much pollution.
- This unique characteristic of rivers is largely destroyed by excessive pollution, damming up of water and canalisation.

- The Department of Water Affairs and Forestry acknowledges that rivers are living systems that should be conserved. Healthy rivers are attractive features that provide us with water and make it possible to save money. The capacity for self-purification that is observed in rivers can make it possible to save thousands of rand that would have to be spent on building purification projects, provided that we protect this capacity.
- Rivers need people to protect their interests and to fight for them.

River catchment areas

- The catchment area of a river, is the area between the mountain peaks where the river has its source and the coast where the river mouth is. The area that is drained by a single river forms its catchment area.
- The characteristic feature of any river is determined by the activities (human and natural) that take place in the catchment area. All the water that is precipitated as snow, dew, mist and rain in any particular catchment area flows together in a river. Only a very small quantity of this water is lost through evaporation.

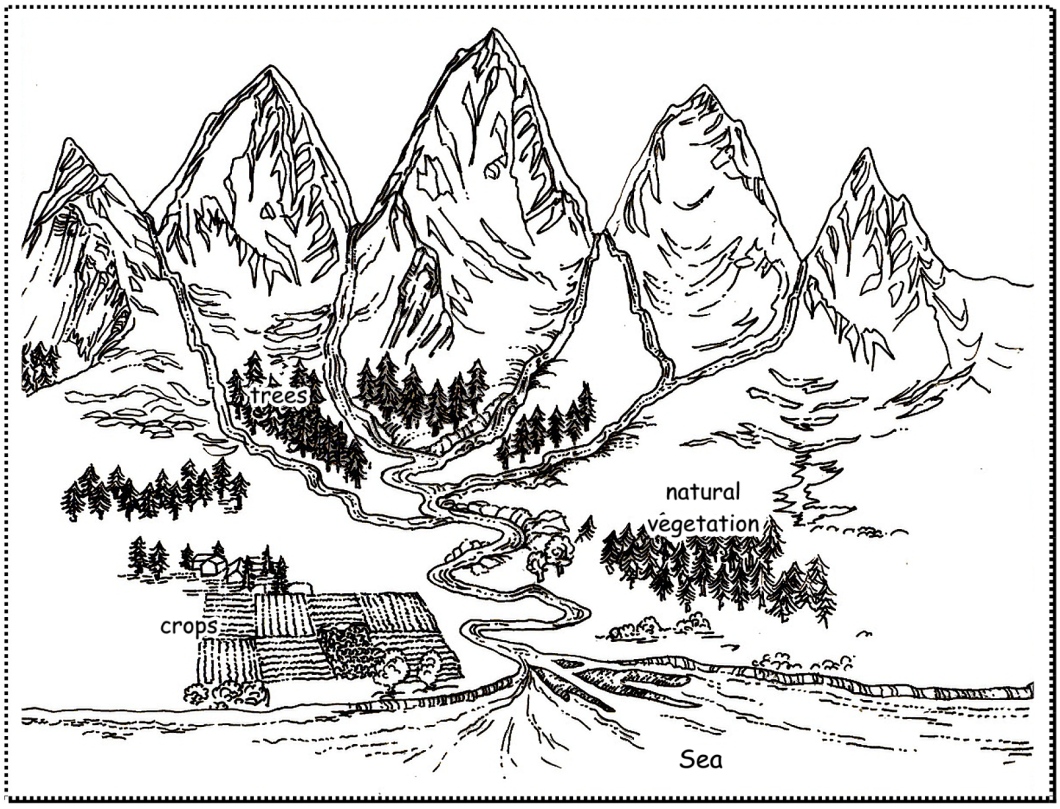


Figure 2.24

2.13.10.1 A catchment area

- The sizes of catchment areas vary greatly. Most of South Africa's large storage dams get their water from such mountain catchment areas.

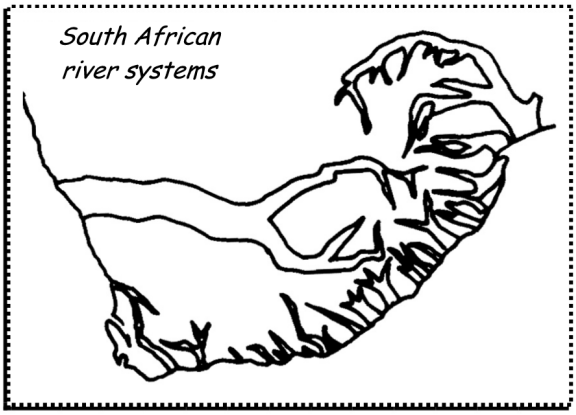


Figure 2.25

There is a close relationship between soil conservation and the use of water from catchment areas. Dense vegetation prevents soil erosion to a large extent. Where the vegetation is removed, especially on steep slopes, rainwater flows fast and the danger that a flash flood can occur is increased. This happened in 1981, when a flood caused serious damage to Laingsburg. When fertile topsoil is removed, storage dams and river mouths become silted up as the soil is deposited in these places.

The fynbos kingdom, which is unique to the Western Cape, is threatened by urbanisation, planting of forests and deforestation in the catchment areas. It is important to protect catchment areas. Most of the plants in the fynbos kingdom are small, hardy and spiky to reduce loss of water during the dry summer months. Some well-known plants from this kingdom are the Ericas, Proteas and the Restios, which are grass-like members of the reed family.

- Invader plants like pine trees have been planted in many places in the catchment areas. Amongst other things, pine trees, together with hakea and Australian acacia species, disturb the natural balance of the river ecosystems of the Western Cape.

FACTORS THAT AFFECT THE QUALITY OF THE WATER IN THE RIVERS.

- All of us must share the responsibility of using water resources responsibly. Every person can make a contribution by becoming involved in our own communities. In this way we can also assist governing bodies and make it easier for them to function.

- All of us need inland water for personal use and we must remember that overpopulation and mismanagement of our limited resources is not a new problem. The Greek philosopher Plato was already complaining about environmental degradation two thousand years ago.
- **POLLUTION** refers to any substance that has a harmful effect on the natural environment. The pollutants might be in the atmosphere, or may occur in water that flows through any part of the catchment area. Pollutants may be very difficult to identify and control.
- **ARTIFICIAL FERTILISERS** are used by farmers to ensure bigger harvests. These nutrients are washed away in rivers. This encourages the growth of algae, which reduces the amount of oxygen in the water.
- **RUBBISH** like tins and plastic bags block up small streams.

- **SEWERAGE** water is rich in organic substances and nutrients that also reduce oxygen levels in the water during decomposition. This destroys many species of life that occur in rivers.
- **HEAT POLLUTION** is caused by pumping warm water into rivers and lakes.
- **TOXIC CHEMICALS** and heavy metals build up in living tissue and increase over time. This inevitably leads to the death of numbers of plants and animals.
- **SOLID WASTE MATERIALS** like soil particles from eroded land, mining activities, coal, dust and builder's rubble also flow along down streams. This suffocates water creatures and their eggs, block up the gills of fish and buries food sources.

- **SALINISATION** indicates an increase of natural minerals in water or in the soil. Fresh water becomes saltier when minerals like sodium, potassium, magnesium, chloride, etc. build up in the water because of evaporation. Global calculations show that one million hectares of soil become unsuitable for agricultural use annually because of salinisation.

- Rivers do have the capacity to be restored, but the degree of pollution plays an important role in the extent to which complete restoration is possible.

Figure 2.26

"Self-restoration" of a river

z	Problems	Serious problems	On the way to recovery	Clear water
Much lifeMuch oxygenNo smellClean water	Fungi developLittle oxygenSlightly smellyGrey or dark water	Organisms that do not need oxygenNo oxygenA smell of rotten eggsBlack water	A little sign of lifeA little oxygenSlightly smellyWater becoming clearer	Much lifeSufficient oxygenNo smellClear water

Table 2.10

- A river can regain its original unpolluted condition provided that it is not diverted into a canal and that interference by people is not too serious.

ASSIGNMENT 10

Go for a walk along a river. What do you observe? Collect samples of shells, feathers, plants, etc. from along the route, but take care to avoid doing damage. Find out whether some parts of the river are more polluted than other parts and whether there are parts that have been restored after being exposed to pollution.

- Write notes in a notebook, take photographs and present your findings to the class.

If you identify an area where the levels of pollution are high, you could also return to it and launch a cleaning operation.

Figure 2.27

ASSIGNMENT 11

Listen to the song "Acid Rain" by Wendy Oldfield. There are more songs that have messages concerning the environment. Draw up a list of such songs and have a class discussion on the issues that are addressed in them.

ASSIGNMENT 12

- Write a composition (280 words) on life in a polluted river.

2.13.11 Assessment

Learning Outcome 1:The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard 1.1: We know this **when the learner**plans investigations;

Assessment Standard 1.2: We know this **when the learner**conducts investigations and collects data.

Chapter 3

Term 4

3.1 To identify materials[1]

3.1.1 NATURAL SCIENCES

3.1.2 The earth and beyond

3.1.3 Properties and uses of materials

3.1.4 EDUCATOR SECTION

3.1.5 Memorandum

Assignment 1 (group work):

TYPE OF MATERIAL	USE
Metals	Used to make knives, forks, pots, pans, and ornaments. (There can be many other examples)
Fibres	Curtains, mats, clothes are made from fibres. (There can be many other examples)
Plastic	Plastic bowls, combs, brushes, etc. (There can be many other examples)
Glass	Window panes, drinking glasses, wine glasses, ashtrays etc. (There can be many other examples)
Wood	Furniture, tables, ornaments etc. (There can be many other examples)

Table 3.1

[1] This content is available online at <http://cnx.org/content/m20273/1.1/>.

3.1.6 LEANER SECTION

3.1.7 Content

3.1.7.1 ACTIVITY: To identify materials [LO 1.1, LO 2.2]

You already know that everything on earth consists of matter, (plants, animals, and non-living things) from a small speck of dust to a large planet.

A pane of glass in a window looks different from a drinking glass, but both are made from the same material, glass. Some substances may look similar and have the same colour but might differ in smell, taste, hardness, texture and elasticity. These are called the properties of materials and are used to describe the materials.

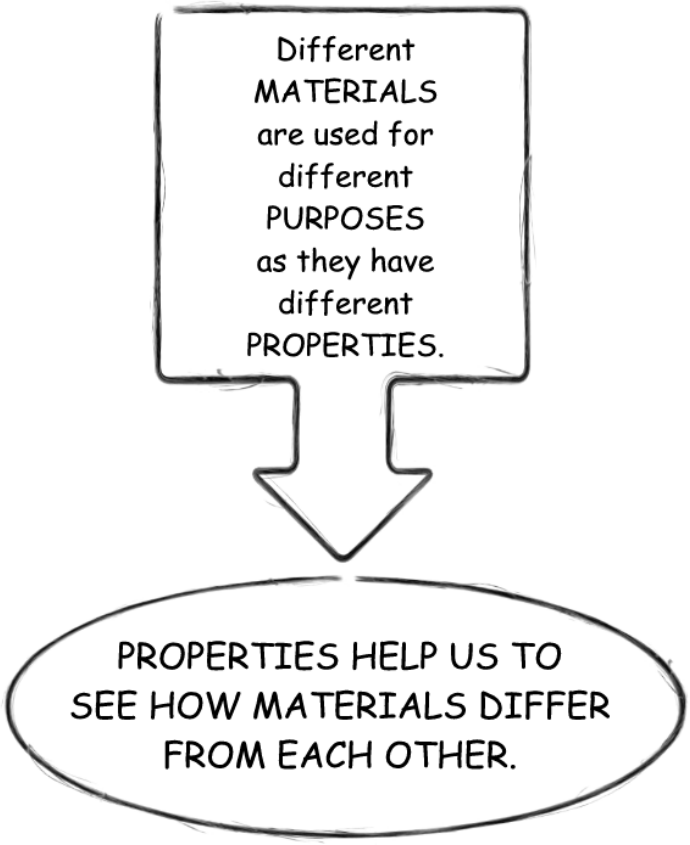


Figure 3.1

ASSIGNMENT (GROUP WORK)

- Work in groups. Look in a newspaper or magazine for a picture that shows different materials.
- Indicate the various kinds of materials that are shown in the picture and say what they are used for.

Type of Material	Uses
Metal	
Fibres	
Plastic	
Glass	
Wood	

Table 3.2

3.1.8 Assessment

Learning Outcome 1:Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

Assessment Standard 1.1: We know this when the learner plans investigations: helps to clarify focus questions for investigation and describes the kind of information which would be needed to answer the question.

Learning Outcome 2:Learners know, interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.2: We know this when the learner categorises information: categorises objects and organisms by two variables.

3.2 To classify materials[2]

3.2.1 NATURAL SCIENCES

3.2.2 The earth and beyond

3.2.3 Properties and uses of materials

3.2.4 EDUCATOR SECTION

3.2.5 Memorandum

3.2.5.1

Complete the following table:

PROPERTIES	SOLID	LIQUID	GAS
VOLUME			It does not have a fixed volume – the volume changes easily. It spreads and occupies the available space.

continued on next page

[2]This content is available online at <http://cnx.org/content/m20276/1.1/>.

FORM		It takes the form of the container.	
WEIGHT			It has weight

Table 3.3

Examples of phase changes:

- Solid to liquid ice to water
- Liquid to solid water to ice
- Liquid to gas boiling water to water vapour
- Gas to liquid water vapour / moisture condensing against glass, e.g. car windows or kitchen windows

3.2.6 LEANER SECTION

3.2.7 Content

3.2.7.1 ACTIVITY: To classify materials [LO 2.2, LO 2.3]

- Classification is when we divide substances with the same properties into groups.
- Scientists classify different materials in different ways. The most well known way is the classification into solids, liquids and gases.

Complete the following table:

PROPERTIES	SOLID	LIQUID	GAS
VOLUME	Has a fixed volume.	Has a fixed volume.	_____
FORM	Has a fixed form.	_____ _____ _____	Takes on the form of the container.
WEIGHT	Has weight.	Has weight.	_____

Table 3.4

A substance can change from one state to another through heating or cooling:

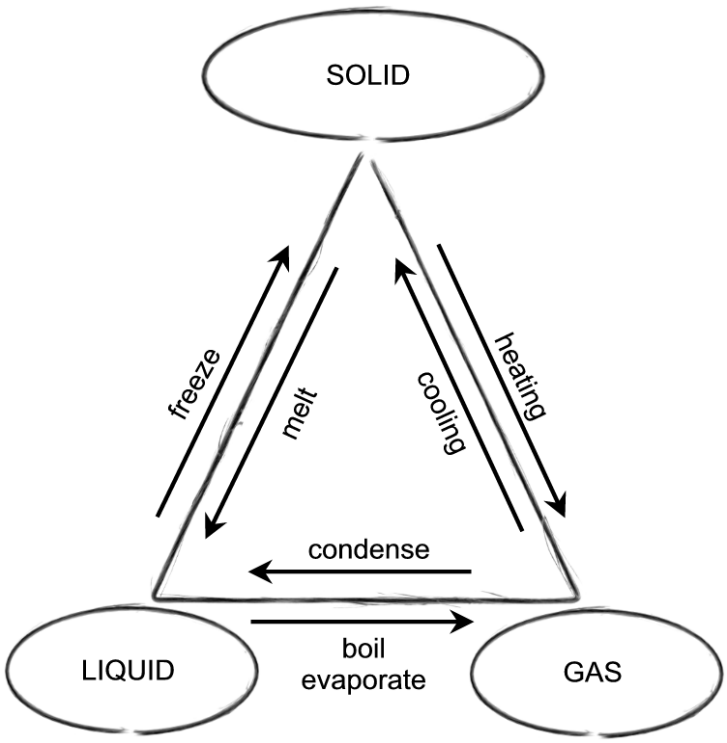


Figure 3.2

Give an example of the following changes:

- Solid to liquid:

- Liquid to solid:

- Liquid to gas:

- Gas to liquid:

3.2.8 Assessment

Learning Outcome 2:Learners know, interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.2: We know this when the learner categorises information: categorises objects and organisms by two variables.

Assessment Standard 2.3:**We know this when the learner**interprets information: at the minimum, interprets information by using alternative forms of the same information.

3.3 To discover the properties of materials[3]

3.3.1 NATURAL SCIENCES

3.3.2

3.3.3 The earth and beyond

3.3.4

3.3.5 Properties and uses of materials

3.3.6

3.3.7 EDUCATOR SECTION

3.3.8

3.3.9 Memorandum

3.3.10

Assignment 6:

1. What is the colour of the crystal?

- Purple

2. What happens to the coloured water around the crystal when the heating begins?

- When the water is heated it rises.

3. What happens to the coloured water near the surface of the water?

- The coloured water near the surface begins to move in a circle in the Pyrex dish. It sinks in the part that is not being warmed by the burner..

Assignment 7:

- (Groupwork)
- When a see breeze is caused by convection, your group should be able to work out how a land breeze occurs. Make sketches and write your explanation here.

How does a land breeze occur?

During the night the land cools more quickly than the sea. The sea stays warm longer than the land. The warm air above the sea rises. Cooler air from the land blows towards the sea

Assignment 8:

1. What happens when you place the pane of glass in front of the heater?

[3]This content is available online at <http://cnx.org/content/m20317/1.1/>.

- Immediately you feel less heat.

- (The heater / source of heat is not warm enough. Glass obstructs radiated heat from the heater, just like wood or cardboard)

Assignment 9:

1. Does your hand immediately feel the heat?

- Yes

2. How does the heat reach your hand?

- Through radiation.

3. Does the glass of the bulb prevent radiance?

- No, because the radiation from a very warm (white hot) object can penetrate glass.

- Explanation: Water conducts electricity and if you touch an electrical appliance while you are standing on the ground the current flows through your body to the ground. This can cause a fatal shock.

3.3.11 LEANER SECTION

3.3.12

3.3.13 Content

3.3.14

3.3.14.1 Activity: To discover the properties of materials [LO 1.2, LO 2.1, LO 2.3]

4. MATERIALS CAN TRANSFER HEAT

If you hold a teaspoon in boiling water it feels warm when you touch it. Heat has thus been transferred from the water to the teaspoon. (This transfer of heat will not happen if both substances are the same temperature.)

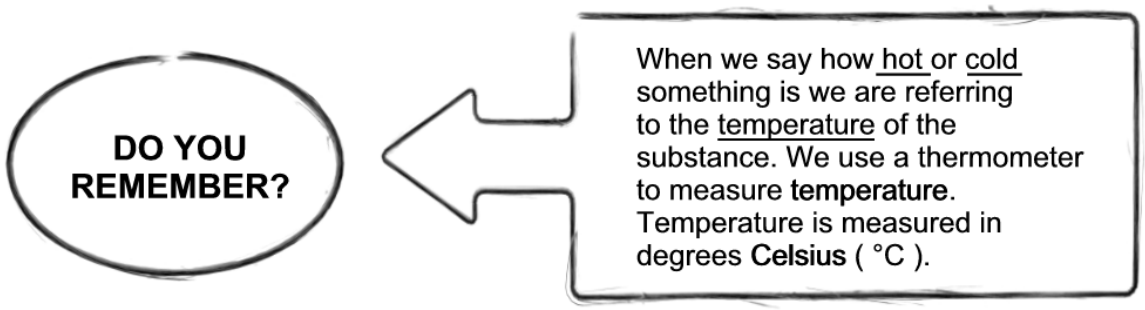


Figure 3.3

Transfer of heat takes place in three ways: Conduction, convection and radiation.

4.1 Conduction:

This is the transfer of heat from one part of a substance to another, while each part remains in its place.

- Conduction takes place in solids.

- Most metals are good conductors of heat.
- Non-metals such as glass, wood, rubber, paper, plastic and asbestos are poor conductors of heat.
- Solids do not all conduct heat equally well.

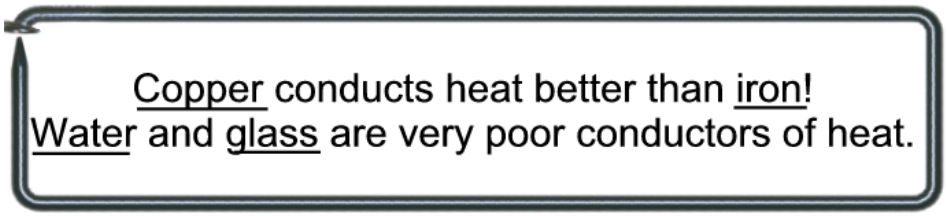


Figure 3.4

Interesting uses of poor conductors:

- Handles of pans, irons, etc. are made of wood or plastic or other poor conductors. This keeps ones hand from getting burnt.
- Clothes (wool, cotton), the furs of animals, feathers, are all poor conductors of heat.
- A glass table top and table mats of wood, cork, cotton or plastic protect shiny wooden table tops from being marked by warm pots.
- Cold meat and cold drink can be kept cold on a long journey by wrapping them in newspaper or a woollen blanket. Paper and wool are poor conductors.
- Ice can be kept for a long time in sawdust or wrapped in a towel.
- Houses with thatched roofs are warm on cold days and cool on hot days.
- House with flat roofs are insulated with a layer of glass fibre above the ceiling.
- Eskimos build houses of snow to protect themselves from the cold.

Give another FIVE examples, each with a short explanation.

1. _____
_____
2. _____
_____
3. _____
_____
4. _____
_____
5. _____
_____

4.2 Convection:

- Convection causes water to rise when heated.
- Convection causes water to sink when it cools.

ASSIGNMENT 6: TO ILLUSTRATE HEAT-EXCHANGE DUE TO CONVECTION

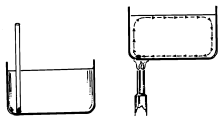


Figure 3.5

Requirements: Pyrex beaker
Glass tube
Burner
Cold water
Potassium permanganate crystals

- Fill a wide Pyrex beaker with cold water.
- Drop a potassium permanganate crystal through a dry glass tube to the bottom of the beaker. Make sure that the crystal is close to the side of the beaker.
- Place your finger firmly over the top of the tube and slowly lift up the tube.
- Heat the beaker slightly - right under the crystal.

What do you observe?

1. What is the colour of the crystal?

_____

2. What happens to the coloured water around the crystal when the heating begins?

_____

_____

3. What happens to the coloured water near the surface?

_____

THE APPLICATION OF CONVECTION IN EVERYDAY LIFE

- Ventilation in a room

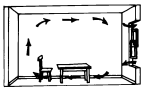


Figure 3.6

When the windows are opened on top and below the hot air leaves the room through the top windows and fresh cool air enters through the lower windows.

- Cooling units

Figure 3.7

In fridges, the freezer pipes are situated at the top. The cold air descends and cools the whole fridge.

- Heating of liquids.

Figure 3.8

When a kettle with water is placed on a warm stove plate the liquid is heated by means of convection.

- Cooling of machines.

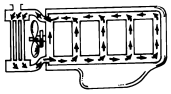


Figure 3.9

Motorcar engines are cooled with water that circulates around each cylinder. By means of convection assisted by the water pump the hot water circulates to the top tank of the radiator. In the thin pipes of the radiator heat is radiated out to the air. The water in the bottom tank is therefore colder than the water in the top tank.

- Land and sea breezes.

Figure 3.10

During the day the land becomes hotter than the sea. The air over the land also becomes warmer and rises. Cooler air coming from the sea takes the place of the warm air. This is how a sea breeze occurs.

Give another two examples of convection. Explain what is happening.

1. _____
_____
_____
2. _____
_____
_____

ASSIGNMENT 7 (GROUP WORK)

- Now that you have seen how a sea breeze occurs, work out how a land breeze occurs. Sketch what happens and write down your explanation below.

4.3 Radiation:

The transfer of heat from the sun to the earth takes place through radiation.

Heat comes from the sun. Between the sun and the earth's atmosphere there is a vacuum. Heat transfer can't take place through conduction or convection.

Radiated heat from the sun reaches us after it has travelled through the atmosphere. Everything that the sun shines on is heated. However, as we go higher up in the atmosphere it becomes colder.

Figure 3.11

ASSIGNMENT 8: TO DEMONSTRATE RADIATION

Requirements:

An electric heater

A windowpane

- Switch on an electric heater.

- Hold your hand 30 cm in front of the heater until you feel the heat.
- Put a windowpane between your hand and the heater.

What do you observe?

1. What happened when you put the windowpane in front of the heater?

_____
_____
_____

ASSIGNMENT 9: TO DEMONSTRATE RADIATION BY MEANS OF A LIGHT BULB

Requirements: Electric light bulb

Windowpane

4 Hold your hand 5 cm away from the light bulb. Switch it on.

4 When you feel the heat, place the windowpane between your hand and the light bulb.

What do you observe?

1. Does your hand immediately feel the heat?

_____

2. How does the heat reach your hand?

_____

3. Does the glass interrupt the radiation?

_____

What is your conclusion?

_____
_____
_____
_____
_____
_____
_____
_____
_____

5. MATERIALS CAN CONDUCT ELECTRICITY

Experiments have proved that the only solids that conduct electricity are metals and graphite. When electricity is conducted, electrons flow through the material but as there is no chemical reaction, no new substances are formed and the weight of the substance remains the same.

Pure water conducts electricity. The ability to conduct electricity increases if an acid is added to the water.

Electricity is a form of energy (like heat). It can be used to heat water and can even cause chemical reactions to take place.

The energy in an electrical current causes water molecules to break up.

It can be summarised like this:

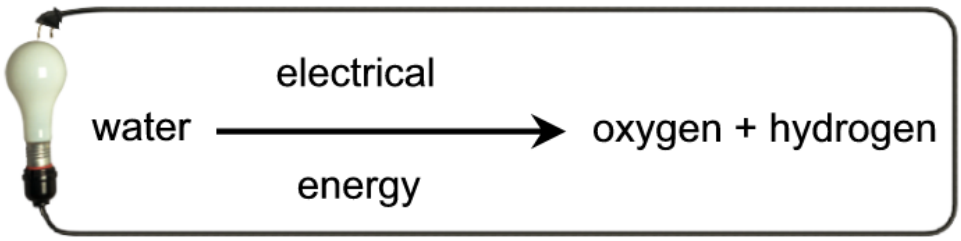


Figure 3.12

This breaking up of the substance is called electrolysis.

- Open electrical wires are dangerous, especially if there is water nearby. Never touch electrical apparatus with wet hands.

Explain:

_____
_____
_____
_____
_____
_____
_____
_____
_____

3.3.14.1.1 Assessment

Learning Outcome 1:Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

Assessment Standard 1.2:**We know this when the learner**conducts investigations and collects data: conducts simple tests or surveys and records observations or responses.

3.3.15 Assessment

Learning Outcome 1:Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

Assessment Standard 1.2:**We know this when the learner**conducts investigations and collects data: conducts simple tests or surveys and records observations or responses.

Learning Outcome 2:Learners know, interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1:**We know this when the learner**recalls meaningful information: at the minimum, describes the features which distinguish one category of thing from another.

Assessment Standard 2.3:**We know this when the learner**interprets information: at the minimum, interprets information by using alternative forms of the same information.

3.3.15.1

3.4 To distinguish the most important groups of materials[4]

3.4.1 NATURAL SCIENCES

3.4.2 The earth and beyond

3.4.3 Properties and uses of materials

3.4.4 EDUCATOR SECTION

3.4.5 Memorandum

[4] This content is available online at <http://cnx.org/content/m20311/1.1/>.

TYPE OF MATERIAL	Metal	Ceramic	Glass	Plastic	Fibre
EXAMPLE	Iron copper	bricks ornaments	bottles ashtrays	plastic-bowls	cotton polyester

Table 3.5

(There can be many other examples)

Assignment 10:

4 (Individual)

The newspaper and flour are wet with water. Then they are mixed to make a new material, paper maché. Through this process a new mixture / compound is created.

By mixing certain materials we can create new products.

(There can be many other examples)

Assignment 11:

4 (Individual)

NATURAL MATERIALS	SYNTHETIC MATERIALS
cotton, silk, wool linen, etc.	polyester, acrylic, viscose, glass fibre

Table 3.6

(There can be many other examples)

3.4.6 LEANER SECTION

3.4.7 Content

3.4.7.1 Activity: To distinguish the most important groups of materials [LO 1.2, LO 1.3, LO 3.2]

- Materials can be classified in various ways.
- Let's look at the groups you already know

Type of Material	Metal:	Ceramics:	Glass	Plastic:	Fibre:
Example	_____	_____	_____	_____	_____

Table 3.7

Mixtures / Compounds

New products are formed when we combine different materials. We can combine water, milk, sugar and coffee powder to make a cup of coffee. We can also combine substances in various ways by mixing them. The appearance and texture of the product usually differs from the original materials. Another example of a mixture is safety glass. A thin plastic layer is sandwiched between two layers of glass.

ASSIGNMENT 10 (INDIVIDUAL)

- To make something by combining substances (materials).

When we combine newspaper, flour and water we get papier-mâché. Make your own dinosaur in the following way.

Requirements:
Water
Flour
Metal wire
Pair of pliers
Newsprint
Paint and brushes
String
Procedure:

- Mix one cup of flour with three cups of water.
- Stir the mixture until it is smooth and creamy.

How to make a wire framework for the dinosaur.

Figure 3.13

- Bend the wire into the shape of a dinosaur with the pair of pliers.
- Fasten the legs and tail to the body with a piece of string.
- The frame should be able to stand on its own.

Completion:

- Tear the newsprint into long strips.
- Soak the strips in the paste.
- Use the soaked strips to build onto the wire framework.
- Allow the figure to dry.
- Complete the dinosaur by painting it.

Conclusion:

In your own words describe the changes that occurred to the newsprint and the flour.

_____
_____
_____
_____

Nowadays most clothes are made from a mixture of materials, for example by combining synthetic and natural fibres.

- Natural substances: Wool, cotton, silk, etc.

Cotton is light and comfortable, but it creases easily and is difficult to iron.

- Synthetic substances: are made by humans, for example polyester, acrylic, viscose, glass fibre, etc. One can see these names on the labels of clothes. Have a look at the labels on your clothes.

When polyester is mixed with cotton we get a new mixture, polyester cotton. It washes easily, dries quickly and irons easily. Denim material is also mixed with Lycra, which yields a strong material that can stretch.

ASSIGNMENT 11 (INDIVIDUAL)

- Look at the labels on your clothes at home and see which materials are used. Try to find as many composite (mixed) materials as possible.

Natural Substances	Synthetic Substances

Table 3.8

More and more materials are being mixed to supply increasing demands. Not all mixtures are manmade however. Bone, for instance, is a natural mixture.

MATERIAL	MADE FROM	USES	ADVANTAGES
Bone	Calcium phosphate +Protein fibres	Skeleton	Harder than protein. More flexible than calcium phosphate.
Reinforced concrete	Concrete mixture + steel reinforcing rods	Construction	Stronger than concrete.Cheaper and lighter than steel.
Glass fibre	Plastic + glass fibres	Boats, caravans	Stronger than plastic.Less fragile than glass.
Carbon fibre reinforced with plastic	Carbon fibre + plastic	Golf clubs, fishing rods, tennis rackets, aircraft parts	Cheaper than pure carbon fibre.Much stronger than plastic.
Tyres	Rubber + rayon/steel wires	Tyres for cars, motor cycles	Stronger than rubber.Still elastic and flexible.
Laminated wood	Various layers of wood	Laminated wood	Cheaper than solid wood.Doesn't warp as easily as solid wood.

Table 3.9

- Identify and research another five examples of mixtures that play an important role in the modern, technological world.

1.

2. _____
_____
_____
_____
3. _____
_____
_____
_____
4. _____
_____
_____
_____
5. _____
_____
_____
_____

3.4.8 Assessment

Learning Outcome 1:Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

Assessment Standard 1.2: We know this when the learner conducts investigations and collects data: conducts simple tests or surveys and records observations or responses.

Assessment Standard 1.3: We know this when the learner evaluates data and communicates findings: relates observations and responses to the focus question.

Learning Outcome 3:Learners are able to show understanding of the interrelationships between science and technology, society and the environment.

Assessment Standard 3.2: We know this when the learner understands the impact of science and technology: suggests ways to improve technological products or processes and to minimise negative effects on the environment.

3.5 To determine the meaning of the term "soluble"[5]

3.5.1 NATURAL SCIENCES

3.5.2 Form, reaction and alteration of materials

3.5.3

3.5.4 EDUCATOR SECTION

3.5.5 Memorandum

Examples: a grease stain is dissolved in alcohol or a detergent, coffee in water, etc.

[5]This content is available online at <http://cnx.org/content/m20312/1.1/>.

3.5.6 LEANER SECTION

3.5.7 Content

3.5.7.1 Activity: To determine the meaning of the term "soluble" [LO 2.3]

A drop of water consists of thousands of small water particles. Sugar also consists of small particles. When sugar is added to water the grains of sugar break down into smaller pieces. These small sugar particles fit between the particles of water. We call this mixture a solution.

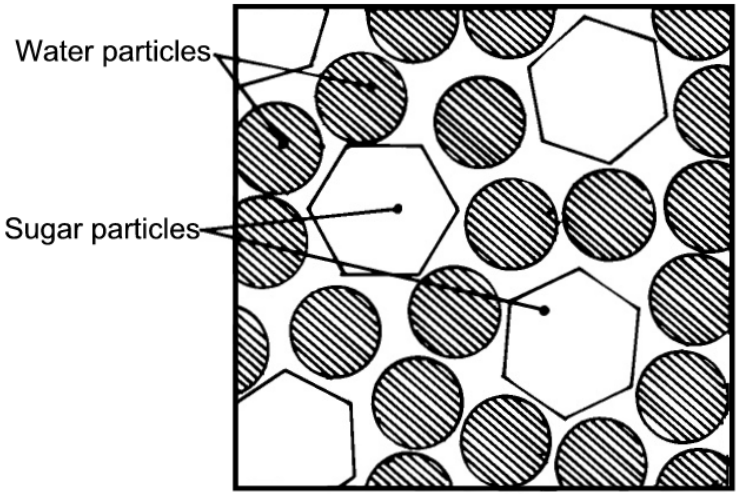


Figure 3.14

Water = solvent
Sugar = dissolved substance
Give another example of a substance that can be dissolved in another substance.

_____
_____
_____
_____
_____
_____

3.5.8 Assessment

Learning Outcome 2:Learners know, interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.3: We know this when the learner interprets information: at the minimum, interprets information by using alternative forms of the same information.

3.6 To determine the factors that affect the solubility of materials[6]

3.6.1 NATURAL SCIENCES

3.6.2 Form, reaction and alteration of materials

3.6.3

3.6.4 EDUCATOR SECTION

3.6.5 Memorandum

1. In which glass is the sugar dissolved quickest?

- In the glass with warm water.

2. Explain why this happens.

- The solubility of a substance is affected by the temperature.

Assignment 13:

- (Groupwork)

1. How many teaspoons of sugar could you dissolve into the glass of water?

- The amount depends on the individual experiment.
- Discus in your group what you could do to dissolve more sugar into the water.

- The water (solution) can be heated.
- The sugar crystals (dissolved substance) and be made finer.

Assignment 14:

Observation: The water has evaporated and small crystals have been formed: copper sulphate crystals. Under the microscope the crystals appear as small blocks or cubes.

Conclusion: When a solution is left to stand the opposite of dissolving occurs. The dissolved substance crystallises into a solid in the form of crystals.

Assignment 15:

1. Is the amount and type of solvent the same in all three cases?

- Yes
- Which substance was dissolved the least after the first teaspoon?

- Corn meal
- Is corn meal insoluble?

- Yes

4. Which substance dissolved best?

[6] This content is available online at <http://cnx.org/content/m20314/1.1/>.

- Salt

Conclusion: Not all substances are equally soluble.
Assignment 16:

1. What do you see?

- Oil does not dissolve. You continue to see drops of oil on the water

2. Where is the oil?

- While you are stirring it seems that the oil is mixed with the water, but the moment that you stop stirring the oil floats to the surface of the water.

3. Can oil dissolve in water?

- No

4. What is the reason for the answer above?

- Particles of oil are strongly attracted to each other. Water particles cannot move in between the oil particles, so oil is not soluble in water.

Assignment 17:
1. What happens?

- The naphthalene flakes do not dissolve in water but do dissolve in mentholated spirits.

2. Can you explain why this happens?

- Naphthalene flakes are not soluble in water.

3. Complete.

- Naphthalene is easily dissolved in mentholated spirits but is not soluble in water

3.6.6 LEANER SECTION

3.6.7 Content

3.6.7.1 ACTIVITY: To determine the factors that affect the solubility of materials [LO 1.1, LO 1.2, LO 1.3]

The solubility of a material is determined by:

- temperature;
- type of material; and
- type of solvent.

ASSIGNMENT 12
To determine how temperature affects solubility.
Requirements: Sugar
A glass of cold water
A glass of warm water
A teaspoon

- Put one teaspoonful of sugar into the glass of cold water and another into the glass of warm water.
- Do not stir the water.
- Observe what happens.

What do you observe?

1. In which glass is the sugar dissolved the quickest?

_____

2. Explain why this happens.

_____

REMEMBER THE FOLLOWING IN CONNECTION WITH SOLUBILITY
Sugar is SOLUBLE in water.
The sugar is the DISSOLVED substance.
The water is the SOLVENT.
The sugar water is the SOLUTION.
HEAT increases the process of solution.

- A saturated solution:

Water can only take a certain amount of a dissolved substance like sugar. When the water can not take more of the substance, we say that it is a saturated solution.

This is what a saturated solution looks like:

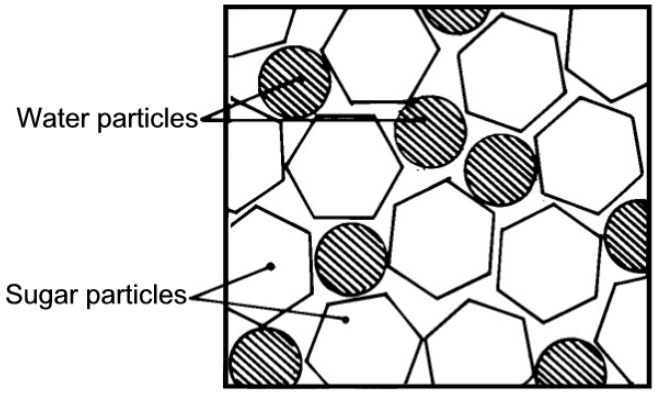


Figure 3.15

(Compare the sketch above to the previous sketch and ensure that you understand the difference.)
ASSIGNMENT 13 (GROUP WORK)
To prepare a saturated solution.
Requirements: Glass of tap water
White sugar
A teaspoon

- Fill the glass half full with tap water.
- Stir a teaspoonful of sugar into the water until it dissolves.
- Stir another teaspoonful of sugar into the water.
- Continue to add sugar to the water, until you observe that the sugar will no longer dissolve.

What do you observe?

1. How many teaspoons of sugar dissolved in the water?

_____

2. How are you able to dissolve more sugar in the water? Discuss this in your group.

_____
_____
_____
_____

ASSIGNMENT 14

To investigate the formation of crystals.

- Make a saturated solution of copper sulphate and water.
- Place a small amount of the solution in a saucer and allow it to stand for a day.
- Write your observations and conclusions. You may use a microscope.

Observation:

_____
_____
_____
_____

Conclusion:

_____
_____
_____
_____
_____
_____
_____
_____

ASSIGNMENT 15

To determine how the type of substance affects solubility.

Requirements: Three clean glasses
Salt
Maize meal
Sulphur
Three teaspoons
Tap water

- Place exactly the same amount of water in each glass.
- Add one teaspoonful of salt to the first glass and stir carefully.
- Count how many teaspoons of salt can be added before the solution is saturated.
- Repeat the experiment using maize meal and sulphur instead of salt.

What do you observe?

1. Is the amount of soluble matter the same in each case?

_____

2. Which substance dissolved the least after the first teaspoonful?

_____

3. Is maize meal soluble?

_____

4. Which substance was most soluble?

_____

Conclusion:

_____
_____

- Not all substances are equally soluble.
- Solubility depends on the type of substance.

ASSIGNMENT 16

Another experiment to show that not all substances are soluble.

Requirements: A glass of tap water
Cooking oil
A teaspoon

- Half fill the glass with water.
- Pour a small amount of oil onto the water.
- Stir the oil and water for a few minutes.

What do you observe?

1. What do you see?

_____
_____

2. Where is the oil?

_____

3. Can oil be dissolved in water?

_____

4. What is the reason for your answer above?

_____
_____
_____
_____
_____
_____
_____
_____

LIKE WATER OFF A DUCK'S BACK

We say this about people who are not overcome by their problems.

Water just rolls off a duck's back.

The duck doesn't get wet at all.

Ducks' feathers are oily.

Water and oil cannot mix, that is why the water runs off the duck's back.

Most aquatic birds have oily feathers.

Penguins and other sea birds become very heavy when they are covered with oil. This happens when the sea is polluted with oil. The birds will eventually drown.

To save them, the oil must be washed off their feathers with detergent.

When they have been washed they cannot be put straight back into the sea because they will be soaked and will get very cold.

The birds have to be looked after for two to three weeks until their feathers have regained the special coating of oil.

ASSIGNMENT 17

To determine how a solvent affects solubility.

Requirements: Water
Methylated spirits

Two glass flasks
Naphthalene flakes (or crushed mothballs)

- Place a small amount of water in one flask and a small amount of spirits in the other.
- Add a teaspoon of naphthalene flakes to each flask and stir.

What do you observe?
1. What happens?

_____
2. Can you explain why this has happened?

_____
3. Complete:
Naphthalene dissolves easily in _____ but does not
dissolve in _____.
REMEMBER:
In all the experiments, except the last one,
we have used only WATER as the solvent.
There are many other solvents that can be used,
like spirits, paraffin etc.

3.6.7.1.1 Assessment

Learning Outcome 1:Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

Assessment Standard 1.1:**We know this when the learner**plans investigations: helps to clarify focus questions for investigation and describes the kind of information which would be needed to answer the question;

Assessment Standard 1.2:**We know this when the learner**conducts investigations and collects data: conducts simple tests or surveys and records observations or responses;

Assessment Standard 1.3:**We know this when the learner**evaluates data and communicates findings: relates observations and responses to the focus question.

3.7 To discus the advantages of water as a solvent[7]

3.7.1 NATURAL SCIENCES

3.7.2 The earth and beyond

3.7.3 Form, reaction and alteration of materials

3.7.4 EDUCATOR SECTION

3.7.5 Memorandum

THE VALUE OF WATER.

- Medium in which animals and plants can live because oxygen is soluble in water.
  - General solvent
- Keeps nature clean ("washes" nature)
- Medium in which processes in the body take place (the contents of our bodies would not interact in powder form.)

[7]This content is available online at <http://cnx.org/content/m20316/1.1/>.

- Doesn't change temperature quickly (has to gain or lose a lot of heat to raise or lower its temperature by 10 C. This enables us to maintain a constant body temperature.).

3.7.6 LEANER SECTION

3.7.7 Content

3.7.7.1 ACTIVITY: To discus the advantages of water as a solvent [LO 2.1, LO 2.3]

Advantages:

- Many aquatic animals are dependent on the oxygen in water. Natural water in rivers and lakes contains oxygen. When the water is colder or when it flows over waterfalls, more gases dissolve into the water. This explains why fish that live in rivers cannot survive in a fish tank at home – there is not enough oxygen.
- Carbon dioxide is soluble in water. An example of this is the gas used in fizzy drinks.
- Medicinal substances (solids or liquids) are dissolved in water to be taken as medicines.
- Dirt in our clothes can be dissolved in water when our clothes are washed.
- We wash ourselves with water every day.
- Sugar, salt and other flavourants dissolve in water. We can use this to flavour foods.
- Dyes are soluble in water.

Disadvantages:

- Poisons can be dissolved in water.
- Too much water in the ground can dissolve the salts and sink deeper into the ground. The soil then has too few minerals.
- Some dyes are soluble in water. When the clothes are washed the colours fade, or the dissolved dyes stain other clothes.

Write a paragraph about the value of water in nature.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

3.7.8 Assessment

Learning Outcome 2:Learners know, interpret and apply scientific, technological and environmental knowledge.

Assessment Standard 2.1: We know this when the learner recalls meaningful information: at the minimum, describes the features which distinguish one category of thing from another;

Assessment Standard 2.3: We know this when the learner interprets information: at the minimum, interprets information by using alternative forms of the same information.

Attributions

Collection: *Natural Sciences Grade 6*
Edited by: Siyavula Uploaders
URL: http://cnx.org/content/col11079/1.1/
License: http://creativecommons.org/licenses/by/3.0/

Module: "To understand clearly what an ecosystem is"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20131/1.1/
Pages: 1-4
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To classify plants according to their characteristics"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20135/1.1/
Pages: 5-8
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To classify animals according to their characteristics"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20139/1.1/
Pages: 9-12
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To indicate differences among vertebrates"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20157/1.1/
Pages: 12-13
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discover how animals are adapted to survive in their habitat"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20141/1.1/
Pages: 14-18
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To understand how animals and insects differ with regard to reproduction/life cycle"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20143/1.1/
Pages: 18-21
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To classify animals according to their feeding habits"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20145/1.1/
Pages: 22-23
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To distinguish between herbivores, carnivores and omnivores"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20147/1.1/
Pages: 23-28
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To describe a neighbourhood ecosystem"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20152/1.1/
Pages: 28-29
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To understand the concepts “biomes” and “symbioses”"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20153/1.1/
Pages: 29-32
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To study the important role of plants in the ecosystem"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20154/1.1/
Pages: 33-39
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To understand the natural balance between living organisms and available sources"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20155/1.1/
Pages: 40-45
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To cultivate a positive altitude towards the environment and natural resources"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20156/1.1/
Pages: 45-47
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to give an overview of energy forms and sources"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20159/1.1/
Pages: 47-48
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to discuss chemical energy as a source of energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20160/1.1/
Pages: 48-52
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to investigate and describe two examples of kinetic energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20205/1.1/
Pages: 52-56
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to discuss sound energy as a form of energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20188/1.1/
Pages: 56-62
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe electrical energy as a form of energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20190/1.1/
Pages: 62-65
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe static electricity and lightning as sources of energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20193/1.1/
Pages: 65-68
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe cells as a source of electrical energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20196/1.1/
Pages: 68-74
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe the battery as a source of electrical energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20198/1.1/
Pages: 74-77
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe the functioning of a dynamo as a source of electrical energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20199/1.1/
Pages: 77-79
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to demonstrate the functioning of coal-driven power stations as systems"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20201/1.1/
Pages: 79-85
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to discuss nuclear power as a method of generating electricity"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20637/1.1/
Pages: 85-89
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe the uses of electrical energy"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20639/1.1/
Pages: 89-91
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe and applythe international colour code for electrical wiring and name safety measures for the use of electricity"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20641/1.1/
Pages: 91-93
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe what energy loss means"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20792/1.1/
Pages: 93-96
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To be able to describe how energy loss can be limited"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20795/1.1/
Pages: 96-98
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discuss the use of stars and planets with regard to the development of calendars"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20213/1.1/
Pages: 99-101
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To indicate the routes taken by early discoverers who navigated by the stars"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20215/1.1/
Pages: 102-103
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discuss the concept constellations and investigating the movement of the stars"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20220/1.1/
Pages: 103-106
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To identify constellations and stars with the help of a planisphere"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20228/1.1/
Pages: 106-113
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To talk about using stars to make predictions"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20231/1.1/
Pages: 113-114
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To find out how african peoples used the position of the stars to their advantage"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20232/1.1/
Pages: 115-116
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discuss igneous rocks as a type of rock formation ["
By: Siyavula Uploaders
URL: http://cnx.org/content/m20234/1.1/
Pages: 116-120
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discuss sedimentary rocks as a type of rock formation"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20239/1.1/
Pages: 120-126
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discuss metamorphic rocks as a type of rock formation"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20243/1.1/
Pages: 126-128
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To explain how fossils were formed"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20249/1.1/
Pages: 128-131
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To talk about the reconstruction, identification and conservation of fossils"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20255/1.1/
Pages: 131-136
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discuss the ways in which organisms change over time"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20259/1.1/
Pages: 137-138
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discuss the role of rivers in nature"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20260/1.1/
Pages: 139-146
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To identify materials"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20273/1.1/
Pages: 147-149
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To classify materials"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20276/1.1/
Pages: 149-152
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discover the properties of materials"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20317/1.1/
Pages: 152-160
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To distinguish the most important groups of materials"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20311/1.1/
Pages: 160-164
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To determine the meaning of the term “soluble”"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20312/1.1/
Pages: 164-165
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To determine the factors that affect the solubility of materials"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20314/1.1/
Pages: 166-171
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

Module: "To discus the advantages of water as a solvent"
By: Siyavula Uploaders
URL: http://cnx.org/content/m20316/1.1/
Pages: 171-172
Copyright: Siyavula Uploaders
License: http://creativecommons.org/licenses/by/3.0/

About Connexions

Since 1999, Connexions has been pioneering a global system where anyone can create course materials and make them fully accessible and easily reusable free of charge. We are a Web-based authoring, teaching and learning environment open to anyone interested in education, including students, teachers, professors and lifelong learners. We connect ideas and facilitate educational communities.

Connexions's modular, interactive courses are in use worldwide by universities, community colleges, K-12 schools, distance learners, and lifelong learners. Connexions materials are in many languages, including English, Spanish, Chinese, Japanese, Italian, Vietnamese, French, Portuguese, and Thai. Connexions is part of an exciting new information distribution system that allows for **Print on Demand Books**. Connexions has partnered with innovative on-demand publisher QOOP to accelerate the delivery of printed course materials and textbooks into classrooms worldwide at lower prices than traditional academic publishers.